azbil

No. CP-SP-1048E

CQ
Compact Recorder
User's Manual

Thank you for purchasing the CQ Compact Recorder. This manual contains information for ensuring correct use of the CQ Compact Recorder. This manual should be read by those who design and maintain control panels and devices that use the CQ Compact Recorder.
It provides necessary information not only for installation, but also maintenance and troubleshooting. Be sure to keep this manual nearby for handy reference.

Azbil Corporation

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact the azbil Group.

In no event is Azbil Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

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SAFETY PRECAUTIONS

■ About Icons

The safety precautions described in this manual are indicated by various icons. Please be sure you read and understand the icons and their meanings described below before reading the rest of the manual.

Safety precautions are intended to ensure the safe and correct use of this product, to prevent injury to the operator and others, and to prevent damage to property. Be sure to observe these safety precautions.

⚠ **WARNING**	Warnings are indicated when mishandling this product might result in death or serious injury.
⚠ **CAUTION**	Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to the product.

■ Examples

	Use caution when handling the product.
	The indicated action is prohibited.
	Be sure to follow the indicated instructions.

⚠ WARNING

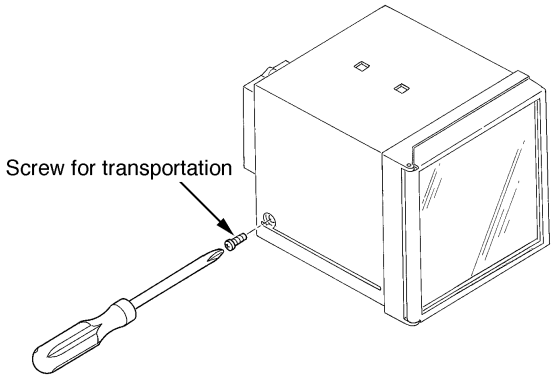
	Before removing, mounting, or wiring the CQ, be sure to turn off the power to the CQ and allconnected devices. Failure to do so might cause electric shock.
	Do not touch electrically charged parts on the CQ such as the power terminals. Doing so might cause electric shock.
	Do not allow lead clippings, chips or water to enter the CQ case. Doing so might cause fire or faulty operation.
	Be sure to attach the terminal cover after wiring the CQ. Failure to do so might cause electric shock.
	Firmly tighten the terminal screw at the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.
	Do not use unused terminal on the CQ as relay terminals. Doing so might cause electric shock, fire or faulty operation.
	Before connecting the CQ to the measurement target or external control circuits, make sure that the FG terminal is properly grounded (100 Ω max.). Failure to do so might cause electric shock.
	Be sure to ground the FG terminal properly (100 Ω max.). Failure to do so might cause electric shock or fire.
	Use the relays on the CQ within the service life listed in the specifications. Continued use of the relays after the recommended service life might cause faulty operation or fire.
	Before changing the chart feed speed, be sure to turn the power OFF. Failure to do so might cause electric shock.
	To prevent danger before you replace the fuse, turn the power OFF, and disconnect the CQ from its power supply. Failure to do so might cause electric shock.
	Use only the specified fuse. Do not use other fuses. Doing so might cause fire.

⚠CAUTION

	Use the CQ within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.). Failure to do so might cause faulty operation.
	When using mounting brackets, tighten screws pushing brackets firmly against the panel so that there is no space between the bracket and the panel. Failure to do so might cause the CQ to fall from the panel or wobble, which is dangerous.
	When wiring terminals, be sure to use crimped terminals.
	Maintain a distance of at least 50 cm between I/O signal leads, communications leads and power leads of 100 V or more. Also, do not pass these leads through the same piping or wiring duct.
	To protect terminals and cables even when wiring cable is pulled, be sure to keep all wiring cables fixed behind the mounting panel.
	Do not connect any wiring to unused-channel terminals or connection-inhibited terminals. Do not use unused terminals as relay terminals. Doing so may result in faulty operation or unfavorable influence on the measurement of the used-channel.
	Do not touch moving parts during operation. Doing so might cause injury.
	When disposing of the CQ unit, observe local bylaws.

Screw for Transportation

The inner mechanism is fixed by screw for transportation to protect the CQ from vibration and shock during transportation. Remove this screw as shown below. The screw for transportation is located on the left side of the unit. After removing the screw using a Phillips screwdriver, store it in a safe place for when the CQ is next transported.



The Role of This Manual

This manual describes both pen type and dot printing type models.
Functions and operation might differ according to the model you use.
Read the sections corresponding to your model. “Pen type” or “Dot printing type” is indicated if there is a difference according to the models.

Organization of This User's Manual

This manual is organized as follows.

Chapter 1. INTRODUCTION

This chapter describes CQ applications and features, and gives a list of model Nos.

Chapter 2. NAMES & FUNCTION OF PARTS

This chapter describes the names and functions of parts of the CQ.

Chapter 3. INSTALLATION & WIRING

This chapter describes precautions, sitting conditions and installation method when installing the CQ into devices, and how to connect to peripheral equipment.

Chapter 4. PREPARATION & OPERATION

This chapter describes checks to carry out before operating the CQ and daily operational procedures.

Chapter 5. BASIC CONFIGURATION

This chapter describes how to set the power frequency and how to set the alarms.

Chapter 6. MAINTENANCE & INSPECTION

This chapter describes inspection items and how to replace maintenance parts to ensure prolonged use of the CQ.

Chapter 7. TROUBLESHOOTING

This chapter describes points to check when the CQ is not working properly and how to remedy trouble that might occur.

Chapter 8. SPECIFICATIONS

This chapter describes the general specifications, performance specifications and external dimensions of the CQ.

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Conventions Used in This Manual

The following conventions are used in this manual.

Handling Precautions : Handling Precautions indicate items that the user should pay attention to when handling the CQ.

Note : Notes indicate useful information that the user might benefit by knowing.

(1) (2) (3) : The numbers with the parenthesis indicate steps in a sequence or indicate corresponding parts in an explanation.

Chapter 1. INTRODUCTION

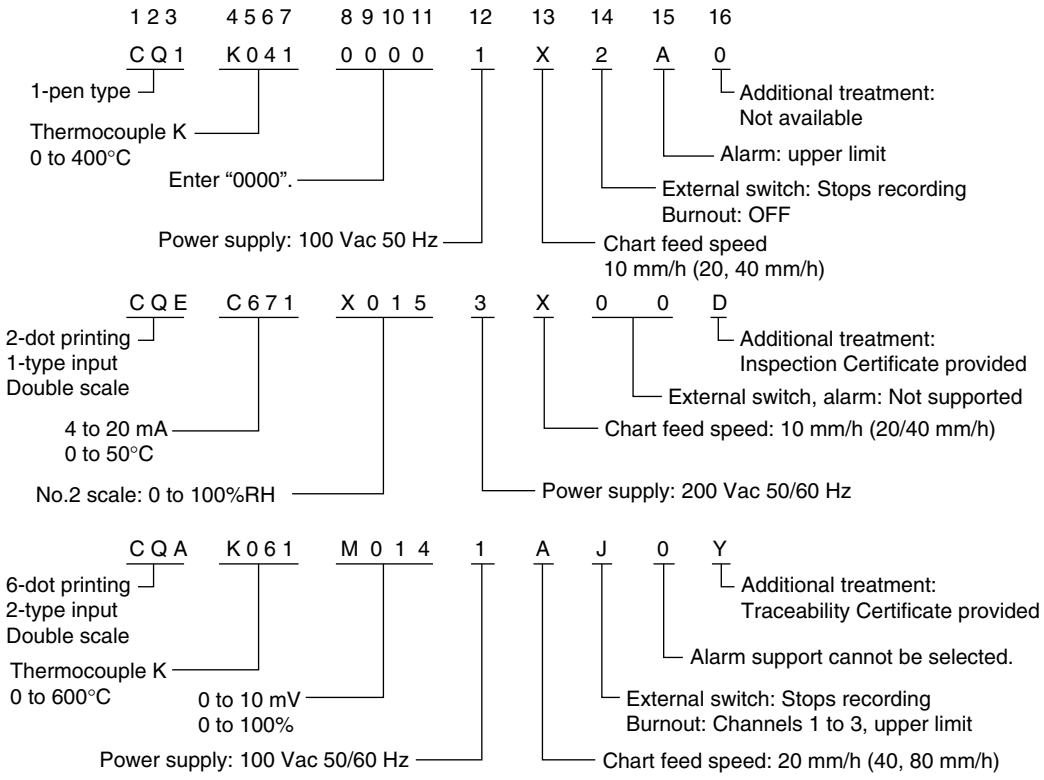
The CQ Compact Recorder accommodates 100 mm wide chart, and comes in two types, pen type or dot printing type. The user can also choose from four available input types, thermocouple, resistance temperature detector, DC voltage or DC current.

■ Features

- Five recording modes are provided: 1-pen, 2-pen, 2-dot printing, 3-dot printing and 6-dot printing.
- The CQ is designed compact and has a depth of only 150 mm. This responds to customers' needs for shallower panels.
- Recording start and stop, and servo lock enable and disable can be controlled by external switch inputs.
- Alarm and burnout functions can be added depending on the model No.
- The carrying handle kit allows the CQ to be installed later on site, and makes it ideal for portable applications.
- Light weight (1-pen type: 1.8 kg)
- The pen can be raised using a lever. (pen type only)
- The chart feed speed can be changed by replacing the gear (provided).
- The pen can be replaced easily. (pen type only)
- Refilling of ink is not necessary, and the ink pad can be replaced easily. (dot printing type only)

■ How the Model Nos. are Configured

● Example of Model No.


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C Q 1 K 0 4 1 0 0 0 0 1 X 2 A 0
1-pen type
Thermocouple K
0 to 400°C
Enter "0000".
Power supply: 100 Vac 50 Hz
Chart feed speed
10 mm/h (20, 40 mm/h)
External switch: Stops recording
Burnout: OFF
Alarm: upper limit
Additional treatment:
Not available
C Q E C 6 7 1 X 0 1 5 3 X 0 0 D
2-dot printing
1-type input
Double scale
4 to 20 mA
0 to 50°C
No.2 scale: 0 to 100%RH
Power supply: 200 Vac 50/60 Hz
Chart feed speed: 10 mm/h (20/40 mm/h)
External switch, alarm: Not supported
Additional treatment:
Inspection Certificate provided
C Q A K 0 6 1 M 0 1 4 1 A J 0 Y
6-dot printing
2-type input
Double scale
Thermocouple K
0 to 600°C
0 to 10 mV
0 to 100%
Power supply: 100 Vac 50/60 Hz
Chart feed speed: 20 mm/h (40, 80 mm/h)
External switch: Stops recording
Burnout: Channels 1 to 3, upper limit
Alarm support cannot be selected.
Additional treatment:
Traceability Certificate provided

● 1-pen Type

1 2 3	4 5 6 7	8 9 10 11	12	13	14	15	16	Descriptions
Basic model No.	Input type Range Unit		Power voltage	Chart feed speed	Additional function: External switch/burnout	Additional function: Alarm	Additional treatment	
CQ1								1-pen
	Table 1 to 3							Input type, range, unit
		0000						Enter “0000”.
			Table 4					Select from Table 4.
				X				10 mm/h (changeable to 20 or 40 mm/h)*1
				A				20 mm/h (changeable to 40 or 80 mm/h)*1
				C				10 mm/min (changeable to 20 or 40 mm/min)*1
				D				20 mm/min (changeable to 40 or 80 mm/min)*1
					Table 6			Select from Table 6.
						Table 7		Select from Table 7.
							Table 10	Select from Table 10.

*1 The chart feed speed can be changed by replacing the gear (provided).

● 2-pen Type

1 2 3	4 5 6 7 8 9 10 11	12	13	14	15	16	Descriptions
Basic model No.	Input type Range Unit	Power voltage	Chart feed speed	Additional function: External switch/burnout	Additional function: Alarm	Additional treatment	
CQ2							2-pen
	Table 1 to 3						Input type, range and unit of channel 1
	Table 1 to 3						Input type, range and unit of channel 2
		Table 4					Select from Table 4.
			X				10 mm/h (changeable to 20 or 40 mm/h)*1
			A				20 mm/h (changeable to 40 or 80 mm/h)*1
			C				10 mm/min (changeable to 20 or 40 mm/min)*1
			D				20 mm/min (changeable to 40 or 80 mm/min)*1
				Table 6			Select from Table 6.
					Table 7		Select from Table 7.
						Table 10	Select from Table 10.

*1 The chart feed speed can be changed by replacing the gear (provided).

● Dot Printing Type/1-type Input Model

1 2 3	4 5 6 7	8 9 10 11	12	13	14 15	16	Descriptions
Basic model No.	Input type Range Unit		Power voltage	Chart feed speed	Additional function: External switch/burnout/alarm	Additional treatment	
CQ3							3-dot printing, 1-type input
CQ6							6-dot printing, 1-type input
CQB							2-dot printing, 1-type input
	Table 1 to 3						Input type, range, unit
		0000					Enter “0000”.
			Table 5				Select from Table 5.
				X			10 mm/h (changeable to 20 or 40 mm/h)*1
				A			20 mm/h (changeable to 40 or 80 mm/h)*1
					Table 8		Select from Table 8.
						Table 10	Select from Table 10.

*1 The chart feed speed can be changed by replacing the gear (provided).

● Dot Printing Type/1-type Input Double-scale Model

1 2 3	4 5 6 7	8	9 10 11	12	13	14 15	16	Descriptions
Basic model No.	Input type Range Unit		No.2 scale Range Unit	Power voltage	Chart feed speed	Additional function: External switch/burnout/alarm	Additional treatment	
CQC								3-dot printing, 1-type input, double-scale
CQD								6-dot printing, 1-type input, double-scale
CQE								2-dot printing, 1-type input, double-scale
	Table 1 to 3							Input type, range, unit
		X						Enter “X”.
			Table 2, 3					Specify range and unit of the No.2 scale range.
				Table 5				Select from Table 5.
					X			10 mm/h (changeable to 20 or 40 mm/h)*1
					A			20 mm/h (changeable to 40 or 80 mm/h)*1
						Table 8		Select from Table 8.
							Table 10	Select from Table 10.

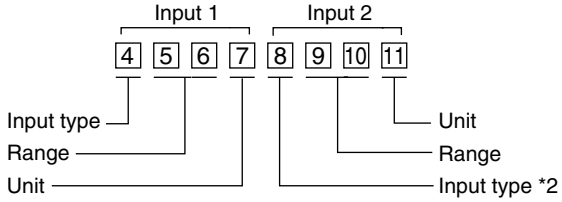
*1 The chart feed speed can be changed by replacing the gear (provided).

● 6-dot Printing Type/2-type Input Double-scale Model

1 2 3	4 5 6 7 8 9 10 11	12	13	14	15	16	Descriptions
Basic model No.	Input type Range Unit	Power voltage	Chart feed speed	Additional function: External switch/burnout	Additional function: Alarm	Additional treatment	
CQA							6-dot printing, 2-type input, double-scale
	Table 1 to 3						Input type, range and unit of channels 1 to 3
	Table 1 to 3						Input type, range and unit of channels 4 to 6
		Table 5					Select from Table 5.
			X				10 mm/h (changeable to 20 or 40 mm/h)*1
			A				20 mm/h (changeable to 40 or 80 mm/h)*1
				Table 9			Select from Table 9.
					0		Alarm function cannot be selected.
						Table 10	Select from Table 10.

*1 The chart feed speed can be changed by replacing the gear (provided).

● Model Configuration of Input Type, Range and Unit



Model	Input 1	Input 2
1-pen type	Input type, range and unit of channel 1	"0000"
2-pen type	Input type, range and unit of channel 1	Input type, range and unit of channel 2
Dot printing type, 1-type input	Input type, range and unit of all channels	"0000"
Dot printing type, 1-type input, double-scale	Input type, range and unit of all channels	Range and unit of No.2 scale *2
6-dot printing type, 2-type input, double-scale	Input type, range and unit of channels 1 to 3	Input type, range and unit of channels 4 to 6

*2 When using 1-type input double-scale model, enter "X" in the input 2 input type box.

Example: K 04 1 0000

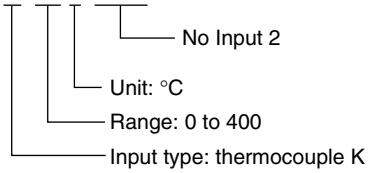


Table 1 Input type

Model No. Code	Input type
T	Thermocouple T (JIS C 1602-1981)
E	Thermocouple E (JIS C 1602-1981)
J	Thermocouple J (JIS C 1602-1981)
K	Thermocouple K (JIS C 1602-1981)
R	Thermocouple R (JIS C 1602-1981)
P	Resistance temperature detector Pt 100 Ω (JIS C 1604-1989)
Q	Resistance temperature detector JPt 100 Ω (JIS C 1604-1989)
C	DC current 4 to 20 mA
V	DC voltage 1 to 5 V
G	DC voltage 0 to 10 V
M	DC voltage 0 to 10 mV
L	DC voltage -5 to +5 mV

Table 2 Range

Model No. Code	Thermocouple T	Thermocouple E	Thermocouple J	Thermocouple K	Thermocouple R
00					
01					
02	0 to 200		0 to 200	0 to 200*	
03	0 to 300	0 to 300	0 to 300	0 to 300	
04		0 to 400	0 to 400	0 to 400	
05				0 to 500	
06		0 to 600	0 to 600	0 to 600	
07					
08			0 to 800	0 to 800	
09					
10				0 to 1000	
11					
12				0 to 1200	0 to 1200
13					
14					0 to 1400
15					
16					0 to 1600
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30	-50 to +150			-50 to +150*	
31					
32					
33					
34					
35	-50 to +100*			-50 to +100*	
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46	-100 to +200				
47					
48					
49					
50					

* : Display accuracy (recording accuracy) ±1.0%FS (Standard conditions, without burnout)

Model No. Code	Resistance Temperature Detector Pt100	Resistance Temperature Detector JPt100
00		
01	0 to 100	0 to 100
02	0 to 200	0 to 200
03	0 to 300	0 to 300
04	0 to 400	0 to 400
05	0 to 500	0 to 500
06		
07		
08		
09		
10	0 to 50	0 to 50
11	0 to 150	0 to 150
12	0 to 250	0 to 250
13		
14		
15		
16		
17		
18		
19		
20		
21	100 to 200	100 to 200
22		
23		
24	50 to 100	50 to 100
25	50 to 150	50 to 150

Model No. Code	Resistance Temperature Detector Pt100	Resistance Temperature Detector JPt100
26		
27		
28		
29		
30	-20 to +40	-20 to +40
31		
32	-25 to +25	-25 to +25
33	-40 to +80	-40 to +80
34	-50 to +50	-50 to +50
35	-50 to +150	-50 to +150
36	-20 to +60	-20 to +60
37	-20 to +80	-20 to +80
38	-10 to +40	-10 to +40
39		
40		
41	-50 to +100	-50 to +100
42	-50 to +200	-50 to +200
43		
44	-100 to +50	-100 to +50
45	-100 to +100	-100 to +100
46	-100 to +200	-100 to +200
47		
48		
49		
50		

Model No. Code	DC Current/ Voltage Range
00	(Blank)
01	0 to 100
02	0 to 200
03	0 to 300
04	0 to 400
05	0 to 500
06	0 to 600
07	0 to 700
08	0 to 800
09	0 to 900
10	-1 to 0
11	-1 to +1
12	-1 to +5
13	-1 to +10
14	-1 to +20
15	-1 to +35
16	-1 to +50
17	15 to 25
18	16 to 26
19	-25 to +25
20	-5 to +55
21	-5 to +60
22	-5 to +5
23	-4 to +4
24	-10 to +10
25	50 to 150
26	-30 to +10
27	-2 to +2
28	-3 to +3
29	
30	-20 to +40
31	-20 to +85
32	-25 to +25
33	-40 to +80
34	-50 to +50
35	-50 to +150
36	-20 to +60
37	-20 to +80
38	-50 to 0
39	-45 to +70

Model No. Code	DC Current/ Voltage Range
40	-200 to +100
41	-50 to +100
42	-50 to +200
43	-80 to +100
44	-100 to +50
45	-100 to +100
46	-100 to +200
47	-200 to 0
48	-200 to +50
49	-150 to +200
50	2 to 10
51	1 to 5
52	17 to 27
53	2 to 12
54	2 to 14
55	4 to 20
56	0 to 760
57	-760 to 0
58	800 to 1200
59	0 to 14
60	0 to 1
61	0 to 2
62	0 to 5
63	0 to 10
64	0 to 20
65	0 to 30
66	0 to 40
67	0 to 50
68	0 to 60
69	0 to 70
70	0 to 80
71	0 to 90
72	0 to 1000
73	0 to 2000
74	0 to 3000
75	0 to 4000
76	0 to 5000
77	0 to 6000
78	0 to 7000
79	0 to 8000

Model No. Code	DC Current/ Voltage Range
80	0 to 9000
81	0 to 3
82	0 to 4
83	0 to 6
84	0 to 7
85	0 to 8
86	0 to 12
87	0 to 15
88	0 to 16
89	0 to 18
90	0 to 25
91	0 to 35
92	0 to 45
93	0 to 150
94	0 to 250
95	0 to 350
96	0 to 450
97	0 to 1500
98	0 to 2500
99	0 to 3500
A0	0 to 4500
A1	0 to 0.1
A2	0 to 0.2
A3	0 to 0.3
A4	0 to 0.4
A5	0 to 0.5
A6	0 to 0.6
A7	0 to 0.7
A8	0 to 0.8
A9	0 to 0.9
B0	0 to 1.5
B1	0 to 2.5
B2	0 to 3.5
B3	0 to 4.5
B4	0 to 1200
B5	0 to 1400
B6	0 to 1600
B7	100 to 300
B8	200 to 400
B9	50 to 100

Table 3 Unit

Model No. Code	Unit
0	(No unit)
1	°C
3	pH
4	%
5	%RH
6	ppm
7	min^{-1}
8	mg/ℓ
9	mV
A	m^3

Model No. Code	Unit
B	m^3/min
C	m^3/h
D	m^3/h [Normal]
E	Hz
F	Ω
G	kΩ
H	MΩ
J	μs/cm
K	mm
L	cm

Model No. Code	Unit
M	m
N	t/h
P	ℓ/min
Q	ℓ/h
S	hPa
T	Pa
V	kPa
W	MPa
Y	ℓ
Z	A

Table 4 Power Supply (pen type model)

Model No. Code	Power Supply Specification
1	100 Vac 50 Hz
2	100 Vac 60 Hz
3	200 Vac 50 Hz
4	200 Vac 60 Hz
5	110 Vac 50 Hz
6	110 Vac 60 Hz

Model No. Code	Power Supply Specification
7	115 Vac 50 Hz
8	115 Vac 60 Hz
9	120 Vac 50 Hz
A	120 Vac 60 Hz
B	220 Vac 50 Hz
C	220 Vac 60 Hz

Model No. Code	Power Supply Specification
D	230 Vac 50 Hz
E	230 Vac 60 Hz
F	240 Vac 50 Hz
G	240 Vac 60 Hz
R	12 Vdc
S	24 Vdc

Table 5 Power Supply (dot printing type model)

Model No. Code	Power Supply Specification
1	100 Vac 50/60 Hz
3	200 Vac 50/60 Hz
5	110 Vac 50/60 Hz
7	115 Vac 50/60 Hz

Model No. Code	Power Supply Specification
9	120 Vac 50/60 Hz
B	220 Vac 50/60 Hz
D	230 Vac 50/60 Hz
F	240 Vac 50/60 Hz

Model No. Code	Power Supply Specification
R	12 Vdc
S	24 Vdc

Table 6 External Switch and Burnout (pen type model)

Model No. Code	External Switch Function	Burnout *3		Applicable Model (basic model No.)
		Channel 1	Channel 2	
0	None	None	None	CQ1, CQ2
1	Servo lock	None	None	CQ1, CQ2
2	Recording stop	None	None	CQ1, CQ2
3	Servo lock, recording stop	None	None	CQ1, CQ2
A	None	Upper limit	None	CQ1, CQ2
B	None	Lower limit	None	CQ1, CQ2
C	None	Upper limit	Upper limit	CQ2
D	None	Lower limit	Lower limit	CQ2
E	Servo lock	Upper limit	None	CQ1, CQ2
F	Servo lock	Lower limit	None	CQ1, CQ2
G	Servo lock	Upper limit	Upper limit	CQ2
H	Servo lock	Lower limit	Lower limit	CQ2
J	Recording stop	Upper limit	None	CQ1, CQ2
K	Recording stop	Lower limit	None	CQ1, CQ2
L	Recording stop	Upper limit	Upper limit	CQ2
M	Recording stop	Lower limit	Lower limit	CQ2
N	Servo lock, recording stop	Upper limit	None	CQ1, CQ2
P	Servo lock, recording stop	Lower limit	None	CQ1, CQ2
Q	Servo lock, recording stop	Upper limit	Upper limit	CQ2
R	Servo lock, recording stop	Lower limit	Lower limit	CQ2
4	None	Upper limit	Lower limit	CQ2
5	None	Lower limit	Upper limit	CQ2
6	Servo lock	Upper limit	Lower limit	CQ2
7	Servo lock	Lower limit	Upper limit	CQ2
8	Recording stop	Upper limit	Lower limit	CQ2
9	Recording stop	Lower limit	Upper limit	CQ2
S	Servo lock, recording stop	Upper limit	Lower limit	CQ2
T	Servo lock, recording stop	Lower limit	Upper limit	CQ2

*3 One of “none”, “lower limit” and “upper limit” can be selected for burnout only when a thermocouple input is used. The burnout function is not available when resistance temperature detector and DC current inputs are used. When these inputs are used, select “none”.

Table 7 Alarm (pen type model)

Model No. Code	Alarm Type
0	None
A	Upper limit
B	Lower limit
C	Upper limit + lower limit
D	Upper limit + upper limit
E	Lower limit + lower limit

Note: Alarms for pen type models can be installed only on channel 1.

Table 8 External Switch, Burnout and Alarm (dot printing models excluding 2-type input)

Model No. Code	External Switch Function	Burnout *4	Alarm Type	Applicable Model (basic model No.)
00	None	None	None	CQ3, CQ6, CQB, CQC, CQD, CQE
0A	None	None	Upper limit	CQ3, CQ6, CQB, CQC, CQD, CQE
0B	None	None	Lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
0C	None	None	Upper limit + lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
0D	None	None	Upper limit + upper limit	CQ3, CQ6, CQB, CQC, CQD, CQE
0E	None	None	Lower limit + lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
20	Recording stop	None	None	CQ3, CQ6, CQB, CQC, CQD, CQE
A0	None	Lower limit	None	CQ3, CQ6, CQB, CQC, CQD, CQE
AA	None	Lower limit	Upper limit	CQ3, CQ6, CQB, CQC, CQD, CQE
AB	None	Lower limit	Lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
AC	None	Lower limit	Upper limit + lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
AD	None	Lower limit	Upper limit + upper limit	CQ3, CQ6, CQB, CQC, CQD, CQE
AE	None	Lower limit	Lower limit + lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
B0	None	Upper limit	None	CQ3, CQ6, CQB, CQC, CQD, CQE
BA	None	Upper limit	Upper limit	CQ3, CQ6, CQB, CQC, CQD, CQE
BB	None	Upper limit	Lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
BC	None	Upper limit	Upper limit + lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
BD	None	Upper limit	Upper limit + upper limit	CQ3, CQ6, CQB, CQC, CQD, CQE
BE	None	Upper limit	Lower limit + lower limit	CQ3, CQ6, CQB, CQC, CQD, CQE
J0	Recording stop	Lower limit	None	CQ3, CQ6, CQB, CQC, CQD, CQE
K0	Recording stop	Upper limit	None	CQ3, CQ6, CQB, CQC, CQD, CQE

*4 One of “none”, “lower limit” and “upper limit” can be selected for burnout only when a thermocouple input is used. The burnout function is not available when resistance temperature detector and DC current inputs are used. When these inputs are used, select “none”.

Table 9 External Switch and Burnout (6-dot printing, 2-type input double-scale)

Model No. Code	External Switch Function	Burnout *5		Applicable Model (basic model No.)
		Channels 1 to 3	Channels 4 to 6	
0	None	None	None	CQA
2	Recording stop	None	None	CQA
A	None	Upper limit	None	CQA
B	None	Lower limit	None	CQA
C	None	Upper limit	Upper limit	CQA
D	None	Lower limit	Lower limit	CQA
J	Recording stop	Upper limit	None	CQA
K	Recording stop	Lower limit	None	CQA
L	Recording stop	Upper limit	Upper limit	CQA
M	Recording stop	Lower limit	Lower limit	CQA
4	None	Upper limit	Lower limit	CQA
5	None	Lower limit	Upper limit	CQA
8	Recording stop	Upper limit	Lower limit	CQA
9	Recording stop	Lower limit	Upper limit	CQA

*5 One of “none”, “lower limit” and “upper limit” can be selected for burnout only when a thermocouple input is used. The burnout function is not available when resistance temperature detector and DC current inputs are used. When these inputs are used, select “none”.

Table 10 Additional Treatment

Model No. Code	Mask Color	Inspection Certificate provided	Tropical Treatment	Traceability Certificate
0	Black	X	X	X
D	Black	O	X	X
T	Black	X	O	X
B	Black	O	O	X
Y	Black	O	X	O
1	Gray	X	X	X
2	Gray	O	X	X
3	Gray	X	O	X
4	Gray	O	O	X

■ Consumables

Model No.	Name	Applicable model	Remarks
CRHL□□□*6	Folding chart (length: 16 m)	All models	1 set (10 packets)
CRP100R	No.1 pen (red)	CQ1, CQ2	1 set (10 pens)
CRP100B	No.2 pen (blue)	CQ2	1 set (10 pens)
81446688-001	Ink pad (for 2-dot printing)	CQB, CQE	1 set (5 p'ces)
81446689-001	Ink pad (for 3-dot printing)	CQ3, CQC	1 set (5 p'ces)
81446690-001	Ink pad (for 6-dot printing)	CQ6, CQA, CQD	1 set (5 p'ces)

*6 □□□ is configured as followed using "Table 1 Input Type" and "Table 2 Range."

CRHL K 04
- Select 0 to 400 from "Table 2 Range".
- Select thermocouple K from "Table 1 Input Type".

CRHL V 01
- Select 0 to 100 from "Table 2 Range".
- Select DC voltage 1 to 5 V from "Table 1 Input Type".

When the input type is DC current or DC voltage, the scale, number of sections and chart paper unit are as shown below.

Model No. Code	DC Current/Voltage Range	Scale	No. of sections	Unit
00	(Blank)	(None)	50	(None)
01	0 to 100	0 to 5, 0 to 10	50	(None)
02	0 to 200	0 to 2, 0 to 20	40	(None)
03	0 to 300	0 to 30, 0 to 60	60	(None)
04	0 to 400	0 to 4, 0 to 8	40	(None)
05	0 to 500	0 to 5, 0 to 10	50	(None)
06	0 to 600	0 to 6, 0 to 12	60	(None)
07	0 to 700	0 to 35, 0 to 70	70	(None)
08	0 to 800	0 to 4, 0 to 8	40	(None)
09	0 to 900	0 to 90	45	(None)
10	-1 to 0	(None)	50	(None)
11	-1 to +1	(None)	40	(None)
12	-1 to +5	(None)	60	(None)
13	-1 to +10	(None)	50	(None)
14	-1 to +20	(None)	50	(None)
15	-1 to +35	(None)	50	(None)
16	-1 to +50	(None)	50	(None)
17	15 to 25	(None)	50	(None)
18	16 to 26	(None)	50	(None)
19	-25 to +25	(None)	50	(None)
20	-5 to +55	(None)	60	(None)
21	-5 to +60	(None)	50	(None)
22	-5 to +5	(None)	50	(None)
23	-4 to +4	(None)	40	(None)
24	-10 to +10	(None)	40	(None)
25	50 to 150	(None)	50	(None)
26	-30 to +10	(None)	40	(None)
27	-2 to +2	(None)	40	(None)
28	-3 to +3	(None)	60	(None)
29	-	-	-	-
30	-20 to +40	(None)	60	(None)
31	-20 to +85	(None)	50	(None)
32	-25 to +25	(None)	50	(None)
33	-40 to +80	(None)	60	(None)
34	-50 to +50	(None)	50	(None)
35	-50 to +150	(None)	40	(None)
36	-20 to +60	(None)	40	(None)
37	-20 to +80	(None)	50	(None)

Model No. Code	DC Current/Voltage Range	Scale	No. of sections	Unit
38	-50 to 0	(None)	50	(None)
39	-45 to +70	(None)	50	(None)
40	-200 to +100	(None)	50	(None)
41	-50 to +100	(None)	50	(None)
42	-50 to +200	(None)	50	(None)
43	-80 to +100	(None)	60	(None)
44	-100 to +50	(None)	50	(None)
45	-100 to +100	(None)	40	(None)
46	-100 to +200	(None)	60	(None)
47	-200 to 0	(None)	40	(None)
48	-200 to +50	(None)	50	(None)
49	-150 to +200	(None)	70	(None)
50	2 to 10	(None)	40	(None)
51	1 to 5	(None)	40	(None)
52	17 to 27	(None)	50	(None)
53	2 to 12	(None)	50	(None)
54	2 to 14	(None)	60	(None)
55	4 to 20	(None)	50	(None)
56	0 to 760	(None)	50	(None)
57	-760 to 0	(None)	50	(None)
58	800 to 1200	(None)	40	(None)
59	0 to 14	0 to 14	70	pH
60	0 to 1	0 to 5, 0 to 10	50	(None)
61	0 to 2	0 to 2, 0 to 20	40	(None)
62	0 to 5	0 to 5, 0 to 10	50	(None)
63	0 to 10	0 to 5, 0 to 10	50	(None)
64	0 to 20	0 to 2, 0 to 20	40	(None)
65	0 to 30	0 to 30, 0 to 60	60	(None)
66	0 to 40	0 to 4, 0 to 8	40	(None)
67	0 to 50	0 to 5, 0 to 10	50	(None)
68	0 to 60	0 to 6, 0 to 12	60	(None)
69	0 to 70	0 to 35, 0 to 70	70	(None)
70	0 to 80	0 to 4, 0 to 8	40	(None)
71	0 to 90	0 to 90	45	(None)
72	0 to 1000	0 to 5, 0 to 10	50	(None)
73	0 to 2000	0 to 2, 0 to 20	40	(None)
74	0 to 3000	0 to 30, 0 to 60	60	(None)
75	0 to 4000	0 to 4, 0 to 8	40	(None)
76	0 to 5000	0 to 5, 0 to 10	50	(None)
77	0 to 6000	0 to 6, 0 to 12	60	(None)
78	0 to 7000	0 to 35, 0 to 70	70	(None)
79	0 to 8000	0 to 4, 0 to 8	40	(None)
80	0 to 9000	0 to 90	45	(None)
81	0 to 3	0 to 30, 0 to 60	60	(None)
82	0 to 4	0 to 4, 0 to 8	40	(None)
83	0 to 6	0 to 30, 0 to 60	60	(None)
84	0 to 7	0 to 35, 0 to 70	70	(None)
85	0 to 8	0 to 4, 0 to 8	40	(None)
86	0 to 12	0 to 6, 0 to 12	60	(None)
87	0 to 15	0 to 15	75	(None)
88	0 to 16	(None)	40	(None)
89	0 to 18	0 to 6, 0 to 12	60	(None)
90	0 to 25	0 to 5, 0 to10	50	(None)
91	0 to 35	0 to 35, 0 to 70	70	(None)
92	0 to 45	(None)	50	(None)
93	0 to 150	0 to 15	75	(None)
94	0 to 250	0 to 5, 0 to10	50	(None)
95	0 to 350	0 to 35, 0 to 70	70	(None)
96	0 to 450	(None)	50	(None)

Model No. Code	DC Current/Voltage Range	Scale	No. of sections	Unit
97	0 to 1500	0 to 15	75	(None)
98	0 to 2500	0 to 5, 0 to 10	50	(None)
99	0 to 3500	0 to 35, 0 to 70	70	(None)
A0	0 to 4500	(None)	50	(None)
A1	0 to 0.1	0 to 5, 0 to 10	50	(None)
A2	0 to 0.2	0 to 2, 0 to 20	40	(None)
A3	0 to 0.3	0 to 30, 0 to 60	60	(None)
A4	0 to 0.4	0 to 4, 0 to 8	40	(None)
A5	0 to 0.5	0 to 5, 0 to 10	50	(None)
A6	0 to 0.6	0 to 6, 0 to 12	60	(None)
A7	0 to 0.7	0 to 35, 0 to 70	70	(None)
A8	0 to 0.8	0 to 4, 0 to 8	40	(None)
A9	0 to 0.9	0 to 90	45	(None)
B0	0 to 1.5	0 to 15	75	(None)
B1	0 to 2.5	0 to 5, 0 to 10	50	(None)
B2	0 to 3.5	0 to 35, 0 to 70	70	(None)
B3	0 to 4.5	(None)	50	(None)
B4	0 to 1200	0 to 6, 0 to 12	60	(None)
B5	0 to 1400	(None)	70	(None)
B6	0 to 1600	(None)	40	(None)
B7	100 to 300	(None)	40	(None)
B8	200 to 400	(None)	40	(None)
B9	50 to 100	(None)	50	(None)

■ Optional Parts

Model No.	Name	Applicable model	Remarks
81446695-001	Carrying handle kit	All models	Power supply lead set (sold separately)
81446696-001	Power supply cable set	(carrying handle kit)	One cable provided (for 100 Vac)

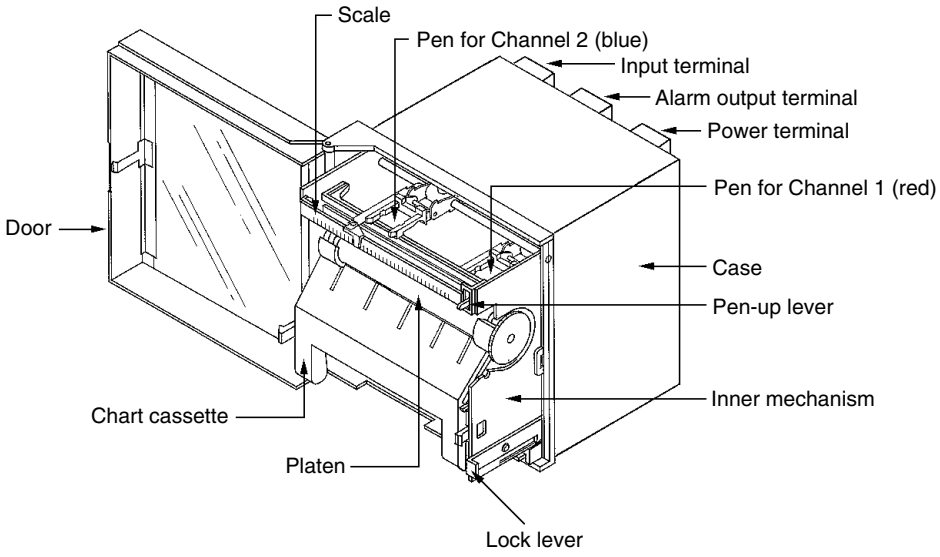
■ Maintenance Parts

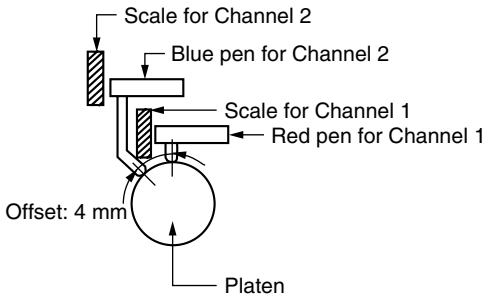
Model No.	Name	Applicable model	Remarks
81446691-001	Fuse	100 to 120 Vac model	1 set (5 p'ces)
81446691-002	Fuse	200 to 240 Vac model	1 set (5 p'ces)
81446691-003	Fuse	12 Vdc 1-pen model and dot printing model 24 Vdc 2-pen model	1 set (5 p'ces)
81446691-004	Fuse	12 Vdc 2-pen model	1 set (5 p'ces)
81446691-005	Fuse	24 Vdc 1-pen model and dot printing model	1 set (5 p'ces)
81446692-001	Mounting bracket	All models	1 set (2 brackets)
81446694-001	Flathead screwdriver	Pen type with alarm	1
CRN 50	Tag plate	All models	1 for each of all models
CRN 30	Allen key	CQ1, CQ2	1
81446697-001	Chart cassette	All models	
81446698-001	Chart guide	All models	Plastic formed component (transparent)
81446699-001	Chart holding spring	All models	Stainless component
81446700-001	Power terminal cover	All models	With screw
81446701-001	Analog input terminal cover (pen type)	CQ1, CQ2	With screw
81446701-002	Analog input terminal cover (dot printing type)	CQ3, CQ6, CQA, CQB, CQC, CQD, CQE	With screw
81446702-001	Alarm terminal cover	Model with alarm	With screw
81446703-001	Door unit	All models	W/pin and spring
81446704-001	Chart drive gear	All models	1 set (large 1, middle 2, small 1)
81446705-001	Screws (M4)	All models	10 pieces

Chapter 2. NAMES AND FUNCTION OF PARTS

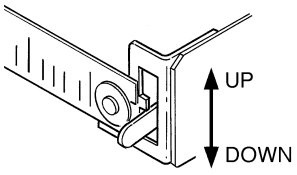
■ Pen Type

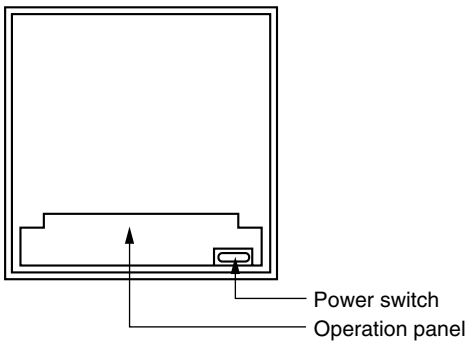
● Main unit





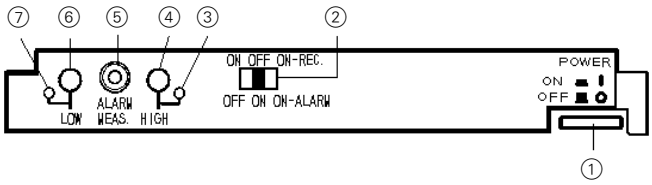
The pen can be raised and lowered using the pen-up lever.
This lever is useful for pausing recording.





● Operation panel

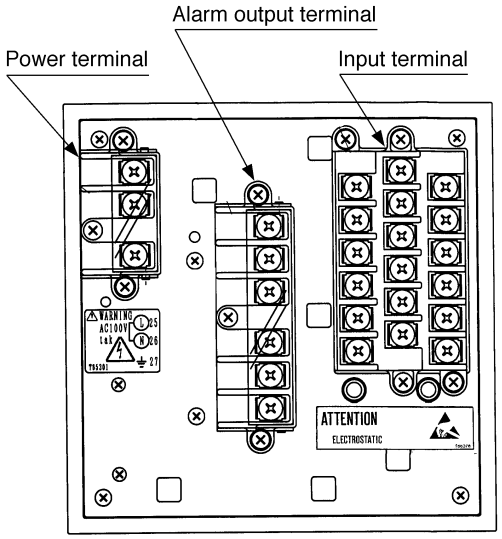
The following describes the names and functions of parts on the operation panel on the pen type model.
The figure below shows the panel with full options. Some options are not mounted depending on the model.



(1) Power switch: Turns the CQ ON and OFF.
(2) Mode switch: Starts or stops recording. When the alarm setting option is provided, it also starts and stops the alarm.
(3) Alarm LED (optional function): Lights when an alarm occurs.
(4) Alarm setup trimmer (optional function): Sets the alarm set point in the alarm setup mode.
(5) Alarm setup switch [ALARM] (optional function): Used to set up the alarm.
When this switch is flipped to the left, alarm setup trimmer ⑥ and alarm LED ⑦ are set to the setup mode, and the pen moves to the currently preset alarm set point.
When this switch is flipped to the right, alarm setup trimmer ④ and alarm LED ③ are set to the setup mode, and the pen moves to the currently preset alarm set point.
When this switch is in the center position, regular operation is carried out, and the pen moves according to input values.
(6) Setup trimmer (optional function): Sets the alarm set point in the alarm setup mode.
(7) Alarm LED (optional function): Lights when an alarm occurs.

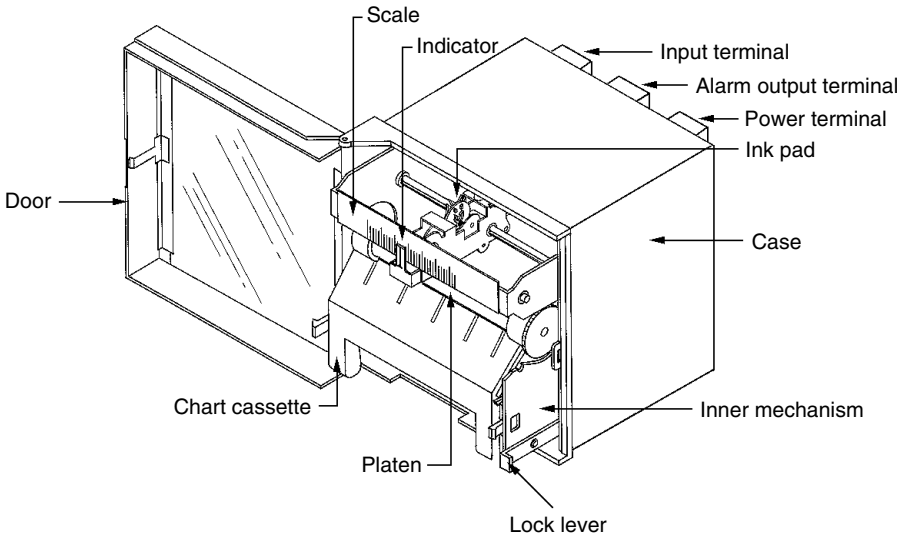
● Terminals on Rear Panel

The following shows the arrangement of the terminals on the rear panel.
There are three sets of terminals on the rear panel of the main unit: power terminals, alarm output terminals and input terminals.



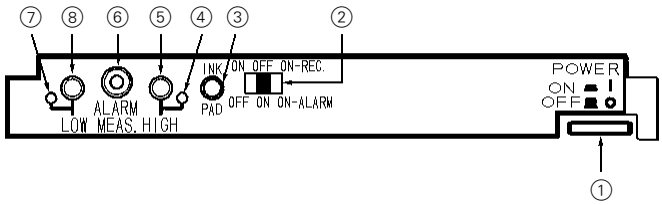
■ Dot Printing Type

● Main Unit



● Operation Panel

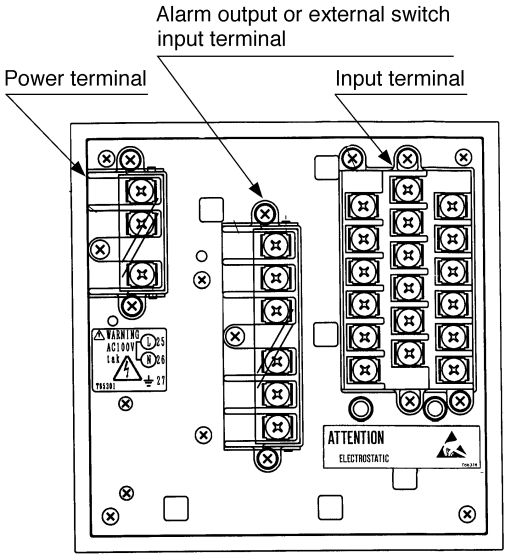
The following describes the names and functions of parts on the operation panel on the dot printing type model.
The figure below shows the panel with full options. Some options are not mounted depending on the model.



(1) Power switch: Turns the CQ ON and OFF.
(2) Mode switch: Starts or stops recording. When the alarm setting option is provided, it also starts and stops the alarm.
(3) Ink pad button [INK PAD]: Push this button to replace the ink pad. Use this button also to fix (register) the setting value when the alarm setting optional is used.
(4) Alarm LED (optional function): Lights when an alarm occurs.
(5) ▶ button (optional function): Moves the indicator to the span (right side) in the alarm setup mode.
(6) Alarm setup switch [ALARM] (optional function): Used to set up the alarm.
When this switch is flipped to the left, alarm LED ⑦ is set to the alarm setup mode, and the ink pad moves to the currently preset alarm set point.
When this switch is flipped to the right, alarm LED ④ is set to the alarm setup mode, and the ink pad moves to the currently preset alarm set point.
When this switch is in the center position, regular operation is carried out, and the pen moves according to input values.
(7) Alarm LED (optional function): Lights when an alarm occurs.
(8) ◀ button (optional function): Moves the indicator to zero (left side) in the alarm setup mode.

● Terminals on Rear Panel

The following shows the arrangement of the terminals on the rear panel.
There are three sets of terminals on the rear panel of the main unit: power terminals, alarm output terminals and input terminals.



Handling Precautions

On some dot printing models, the alarm output terminal plate is used as the external switch input terminal plate.

■ Material

The following table is for plastic parts that weigh more than 50 g.

Item	Material Code	Material Name
Case	m-PPE	Deformed Polyphenylen ether
Chart cassette main part	PC-GF10	Polycarbonate (containing 10% glass fiber)

Chapter 3. INSTALLATION & WIRING

3 - 1 Installation Site

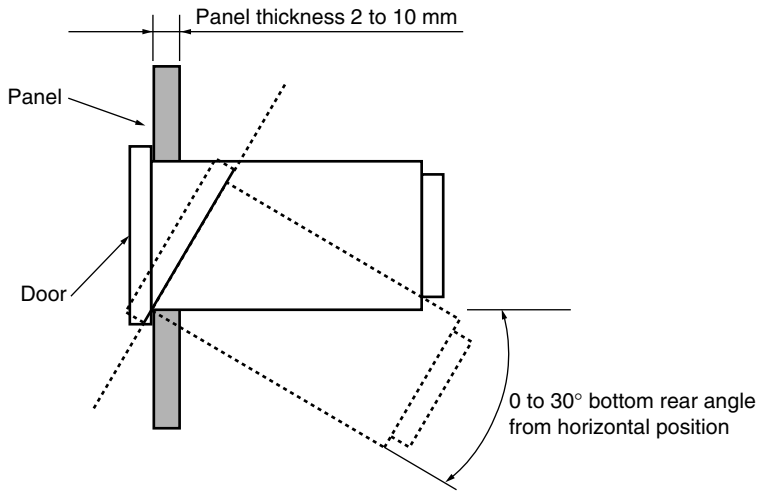
⚠ CAUTION

Use the CQ within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, installation direction, atmosphere, etc.).
Failure to do so might cause faulty operation.

Install the CQ at a location that satisfies the following conditions:

- Locations that are not subject to excessive temperature and humidity changes.
- Locations that are not subject to direct sunlight, wind and rain.
- Locations that may not splashed with water, oil or chemical mist.
- Locations that are not subject to corrosive and flammable gasses.
- Locations that are hardly subject to dust or oil smoke.
- Locations that are hardly subject to vibration or shock.
- Locations that are not subject to strong electrical and magnetic fields.
- Locations that are hardly subject to the influence of electrical noise (near by high-voltage ignition equipment, welding equipment, etc.).

Keep the mounting angle to within 0 to 30 degrees from the bottom rear.



3 - 2 Installation

⚠ WARNING

Before removing, mounting, or wiring the CQ, be sure to turn off the power to the CQ and all connected devices. Failure to do so might cause electric shock.

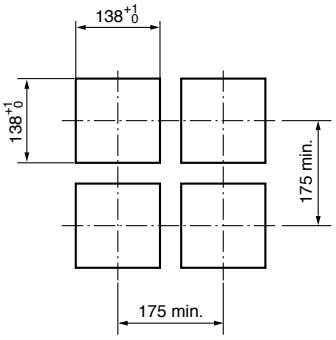
⚠ CAUTION

When using mounting brackets, tighten screws pushing brackets firmly against the panel so that there is no space between the bracket and the panel.
Failure to do so might cause the CQ to fall from the panel or wobble, which is dangerous.

■ Installation Dimensions

Use a metal sheet 2 mm or more thick or equivalent as the panel.
The panel cutout dimensions are as follows:

(Unit: mm)

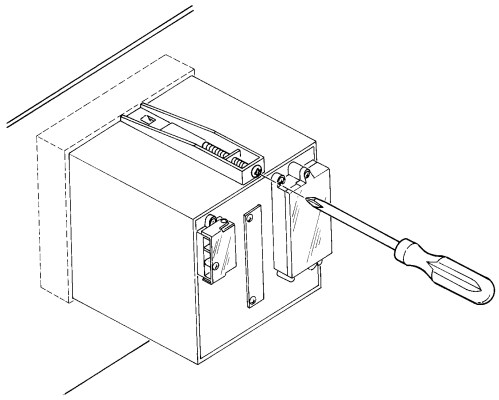


Handling Precautions

The CQ cannot be gang-mounted.

■ Procedure

1. Insert the main unit case from the panel front.
2. Install the CQ into the panel using the mounting brackets.



Handling Precautions

The recommended tightening torque for the mounting bracket is 0.5 to 0.8 N·m. Tightening the mounting bracket at a torque higher than this might deform or damage the case.

3 - 3 Wiring Precautions

⚠WARNING

- Before removing, mounting, or wiring the CQ, be sure to turn off the power to the CQ and allconnected devices. Failure to do so might cause electric shock.
- Do not touch electrically charged parts on the CQ such as the power terminals.
  Doing so might cause electric shock.
- Do not allow lead clippings, chips or water to enter the CQ case.
  Doing so might cause fire or faulty operation.
- After wiring the CQ, attach the terminal cover.
  Failure to do so might cause electric shock.
- Firmly tighten the terminal screws at the torque listed in the specifications.
  Insufficient tightening of terminal screws might cause electric shock or fire.
- Do not use unused terminal on the main unit as relay terminal.
  Doing so might cause electric shock, fire or faulty operation.
- Be sure to ground the FG terminal with grounding resistance 100 Ω max.
  Failure to do so might cause electric shock.
- Before connecting the CQ to the measurement target or external control circuits, make sure that the FG terminal is properly grounded (100 Ω max.).
  Failure to do so might cause electric shock or fire.
- Use the relays on the CQ within the service life listed in the specifications.
  Continued use of the relays after the recommended service life might cause faulty operation or fire.

⚠CAUTION

- When wiring terminals, be sure to use crimped terminals.
- Maintain a distance of at least 50 cm between I/O signal leads, communications leads and power leads of 100 V or more. Also, do not pass these leads through the same piping or wiring duct.
- To protect terminals and cables even when wiring cable is pulled, be sure to keep all wiring cables fixed behind the mounting panel.

Handling Precautions

- Before wiring the CQ, check the model Nos. of instruments and terminal Nos. on the affixed labels.
- After wiring the CQ, be sure to check the wiring for any mistakes before turning the power ON.
- When installing the CQ in locations subject to vibration or impact, be sure to use round crimped terminals.
- Use round crimped terminals with insulation shield.
- When wiring with round crimped terminals, take care to prevent contact with adjacent terminals.
- Connect the CQ by one-point grounding using the FG terminal (terminal No. 27). Do not perform any jump wiring.
- When there are many shielded cables grounded, prepare a separate ground terminal (earth bar).
  Grounding type: Resistance 100 Ω max.
  Grounding conductor: Annealed copper wire more than 2 mm^2 (AGW 14)
  Grounding conductor length: Max. 20 m
- Wiring analog input wiring to other equipment in parallel may adversely affect mutual measurement values. The burnout function may not function for thermocouple inputs. If this happens, set the burnout function to “none”. Alternately, if the power of one of the connected equipment is turned OFF during operation, this may also adversely affect the measurement values on the other equipment.
- Resistance temperature detectors cannot be connected in parallel.

■ Noise Countermeasures

● Noise generating sources

Generally, the followings generate electrical noise:
(1) Relays and contacts
(2) Solenoid coils, solenoid valves
(3) Power lines
(4) Induction loads
(5) Motor commutators
(6) Phase angle control SCR
(7) Wireless communications equipment
(8) Welding equipment
(9) High-voltage ignition equipment

● Noise reducing countermeasures

If the influence of electrical noise cannot be eliminated, we recommend using a CR filter for fast-rising noise, and varister for noise with a high wave height.

Note

- Recommended CR filter Model No.: 81446365-001
- Recommended varister Model No.: 81446366-001 (100 V)
  81446367-001 (200 V)

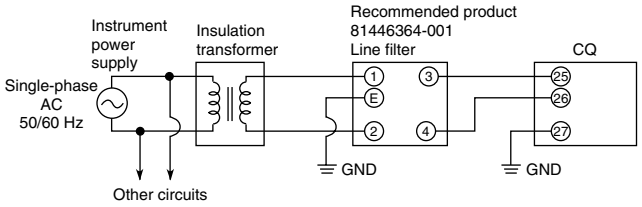
Handling Precautions

The varister may be short-circuited when trouble occurs. Pay attention to this when providing a varister on the CQ.

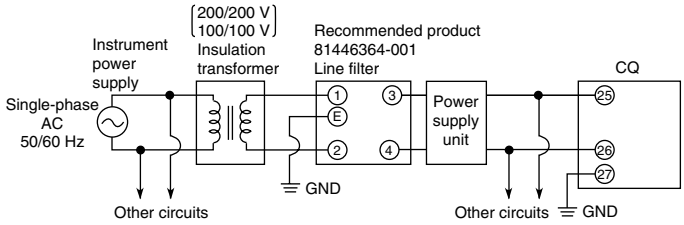
3 - 4 Connecting the Power Supply and Ground

- Use 600 V vinyl-insulated power lead (JIS C 3307) as the power supply lead.
- Obtain the CQ power supply from a single-phase instrumentation power supply not subject to excess noise.
- On DC models, use a power supply unit within the specification.
- If the power supply generates excessive electrical noise, add an insulating transformer, and use a line filter.
  (recommended line filter: Model No. 81446364-001)
- Keep the wiring from the line filter as short as possible. Bundling this wiring together is effective against electrical noise.
- After providing anti-noise countermeasures, do not bundle primary and secondary power leads together, or pass them through the same piping or wiring duct.
- Connect the CQ by one-point grounding to the protective ground terminal. Do not perform any jump wiring. When it is difficult to ground shielded cables, prepare a separate ground terminal (earth bar).
- Grounding type: Resistance 100 Ω max.
- Grounding conductor: Annealed copper wire more than 2 mm^2 (AGW 14)
- Grounding conductor length: Max. 20 m

(AC model)



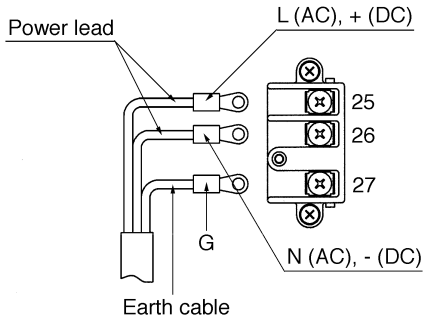
(DC model)



! Handling Precautions

Take rush current into consideration when installing a power switch or fuse outside the CQ.

Open the power wiring cover (transparent) by loosening the screws.
Connect the power leads and earth cables to the power terminals.
Close the power wiring cover (transparent) by tightening the screws.



3 - 5 I/O Signal Leads

⚠CAUTION

Do not connect any wiring to unused-channel terminals or connection-inhibited terminals. Do not use unused terminals as relay terminals.
Doing so may result in faulty operation or unfavorable influence on the measurement of the used-channel.

● **Thermocouple input signal lead**

In the case of thermocouple input, connect the bare thermocouple lead to the terminal. If the thermocouple is located a long way from the CQ, or the thermocouple is connected to a terminal, extend the connection using a compensating lead and then connect to the terminal.
Use shielded compensating leads only.

● **Resistance temperature detector input signal lead**

- Use three conductors.
- For the conductor, use JKEV-SB (JCS4364) instrument cable or equivalent product. (This is generally referred to as "twisted shielded cable for instruments".)
- The wiring resistance is 10 Ω max.
- Balance the resistance of the three conductors so that they are the same values.

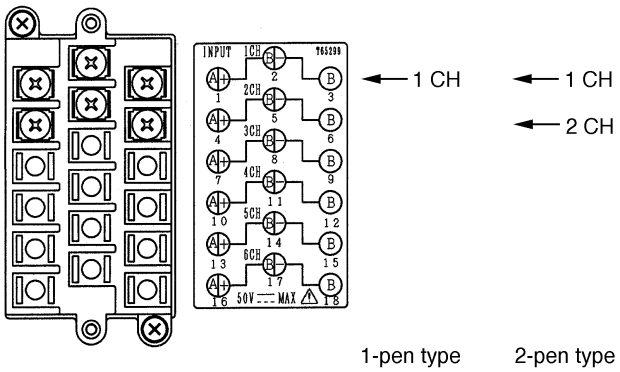
● **Digital I/O leads other than thermocouple and resistance temperature detector**

- Use twisted shielded cable for instruments.
- Shielded, multi-core microphone cord (MVVS) can be used if there is relatively little electromagnetic induction.

■ Wiring Inputs

Set the power switch to OFF.
Remove the screws of the terminal cover (transparent) to remove the cover.
Connect the input leads to the input terminals.
Attach the terminal cover (transparent) and tighten the screws.

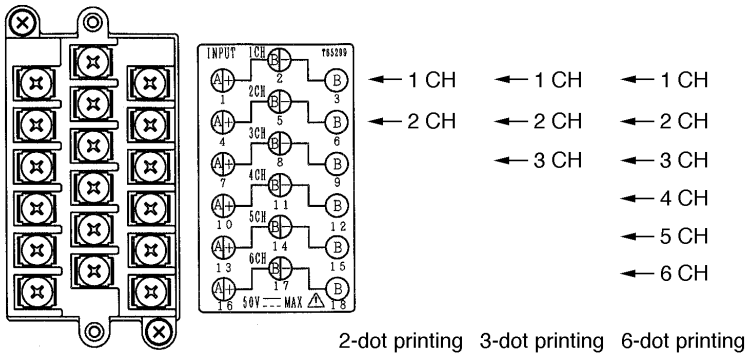
● **Input terminal positions (pen type model)**



! Handling Precautions

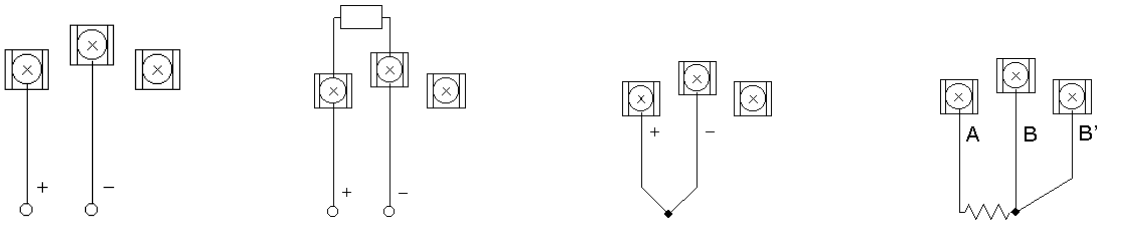
The number of terminal screws and wiring labels differ between 1-pen type model and 2-pen type model. This figure shows the 2-pen type without optional functions supported.

● Input terminal positions (dot printing type model)



● Wiring inputs

Shunt resistor: 250 Ω (provided)



Voltage input | Current input | Thermocouple input | Resistance temperature detector input

Note

If an unused channel other than the current (4 to 20 mA) range is open, dots may be randomly printed because the input is undefined. To prevent this, take countermeasures such as short-circuiting the appropriate input terminals.*1, *2

If input terminals are short-circuited, dots will be printed in the positions indicated below, according to the range.

- Current range C (4 to 20 mA): Dots are printed at 0 % and further left on the chart (to the leftmost limit).
- Voltage range V(1 to 5 V) : Dots are printed at 0 % and further left on the chart (to the leftmost limit).
- Voltage range G (0 to 10 V) : Dots are printed at the 0 % position on the chart.
- Voltage range M (0 to 10 mV) : Dots are printed at the 0 % position on the chart.
- Voltage range L (-5 to +5 mV) : Dots are printed at the 50 % position on the chart.
- Thermocouple range: Dots are printed at around the room temperature position.
- RTD range *1: Dots are printed at 0 % and further left on the chart (to the leftmost limit).

*1. For the RTD range, short-circuiting of 3 terminals (A, B, and B') is required. If only 2 terminals (A and B) are short circuited, dots are randomly printed because the input is undefined.

*2. For the current (4 to 20 mA) range, short-circuiting is not required because a resistor is connected to the input terminals.

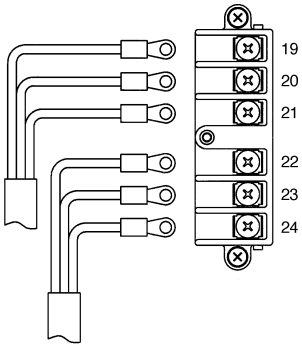
It is not possible to stop dot printing for the unused channels. However, it is possible to prevent ink from being transferred to the chart. To do this, remove the ink pads for the unused channels with tweezers or the like.

■ Wiring Alarm Output (optional function)

Set the power switch to OFF.
Remove the screws of the terminal cover (transparent) to remove the cover.
Connect the output leads to the input terminals.
Attach the terminal cover (transparent) and tighten the screws.

The specifications of output relays are as follows:
Output type: relay contact output (both normally open and normally closed)
Output capacity: 250 Vac, 3 A 30 Vdc, 3 A (resistive load)

● Terminal positions of alarm outputs



	Function				
Model	Upper limit	Lower limit	Upper limit + lower limit	Upper limit + upper limit	Lower limit + lower limit
C NC NO	Upper limit	None	Upper limit	Upper limit 2	Lower limit 2
C NC NO	None	Lower limit	Lower limit	Upper limit 1	Lower limit 1

! Handling Precautions

The alarm output relays are not compatible with switching of minute loads.
Min. applicable load: 5 Vdc 100 mA, 24 Vdc 50 mA

■ Wiring External Switch Inputs (optional function)

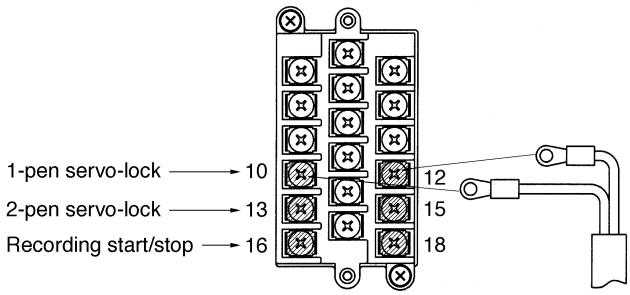
Set the power switch to OFF.
Remove the screws of the terminal cover (transparent) to remove the cover.
Connect the external switch input leads to the input terminals.
Attach the terminal cover (transparent) and tighten the screws.
For the external switch, use a contact (switch) which satisfies the following specifications:

- Servo lock function (pen type only)
  Type: dry contact
  Capacity: 20 Vdc, 500 mA min.
- Recording stop function
  Type: dry contact
  Capacity: 20 Vdc, 100 mA min.

! Handling Precautions

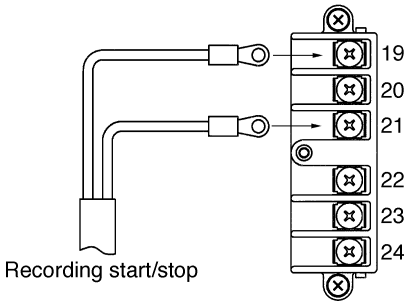
For external switch inputs, be sure to use dry contacts such as relays. External switch inputs do not function on open collectors.

● Pen type



Connect external switch inputs to the terminal for the respective function.

● Dot printing type



Chapter 4. PREPARATION & OPERATION

4 - 1 Preparation

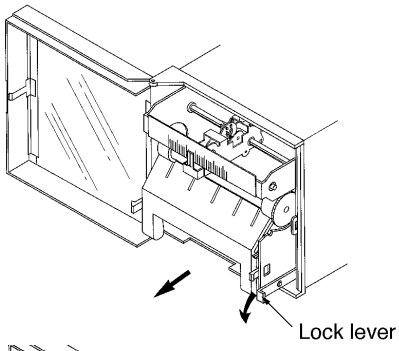
⚠CAUTION

Do not touch moving parts during operation.
Doing so might cause injury.

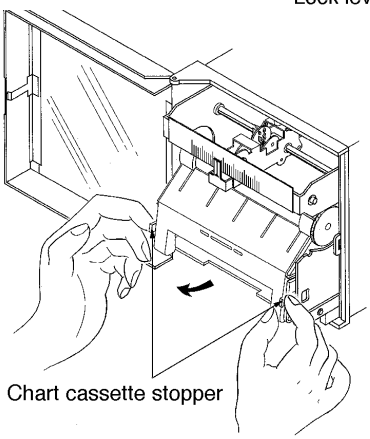
This section describes how to load the chart, pen (for pen type) and ink pad (for dot printing type) before you start operation.
Be sure that the mode switch is set to “recording stop”.
This can be done with the power ON.

■ Loading (replacing) the Chart

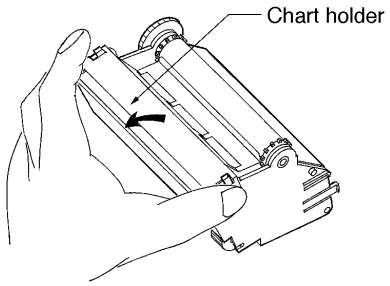
(1) Open the door, pull down the lock lever on the right side, and draw out the inner mechanism towards you.



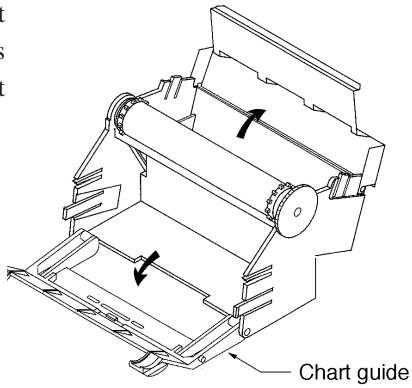
(2) Remove the chart cassette from the main unit by lightly pressing in the chart cassette stoppers located on the left and right edges of the chart cassette.



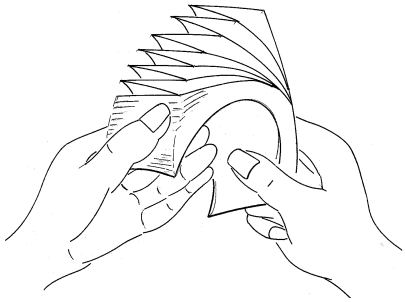
(3) Open the chart cassette by lifting up the chart holder.



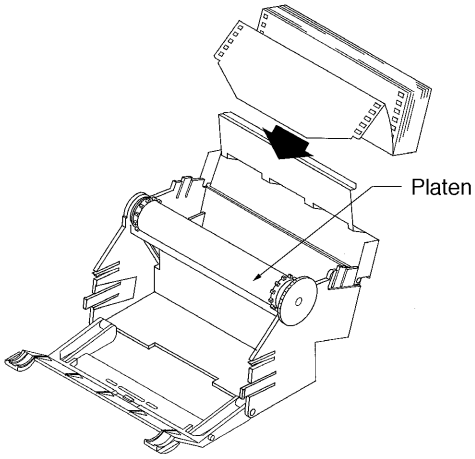
(4) Lower the chart guide (transparent plastic) towards you. The chart guide is located on the front of the chart cassette.



(5) Before you load the chart, lightly fan the chart.



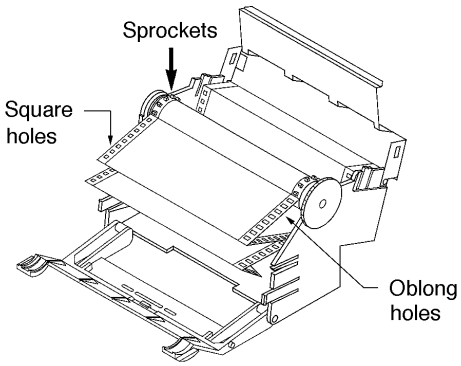
(6) Insert the chart into the chart holder making sure that it is facing the direction of the arrow.



Handling Precautions

Load the chart delivery section so that the chart is fed from the front. Loading the chart delivery section so that the chart is fed from the inside may cause malfunction.

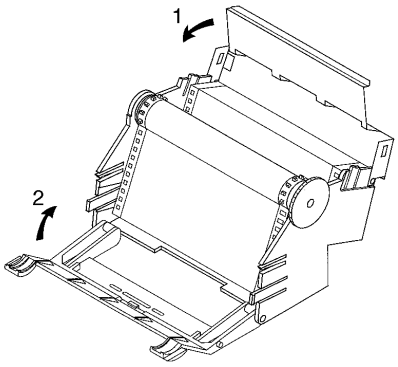
(7) Draw out the leading edge of the chart by approx. 15 cm (2 to 3 folds), and align the chart so that the sprockets fit into the holes on both sides of the chart.



Handling Precautions

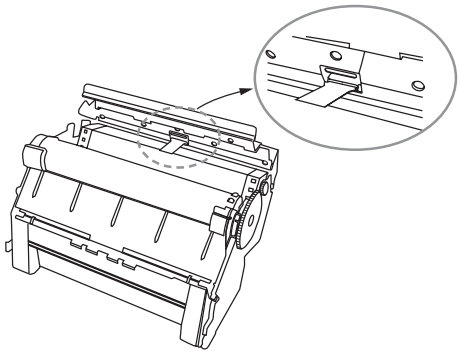
Load the chart correctly. Make sure that the square holes are located on the left side and the oblong holes are located on the right side.

(8) Make sure that the chart is not lifting up from the platen, and then return the chart holder to its original position.
Also, close the chart guide (transparent plastic) on the front side.

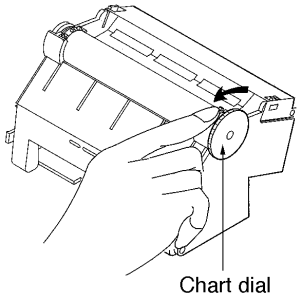


Handling Precautions

Before returning the chart holder to its original position, make sure that the paper feed fixing plate is protruding above the chart as shown below.

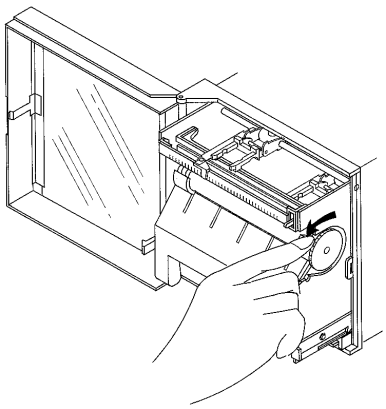


(9) Turn the chart feed dial a few times to make sure that the chart is fed correctly. Also, make sure that the chart is loaded in the cassette correctly.



(10) Hook the protrusions of the chart cassette into the grooves on the main unit and push the chart cassette in. Make sure that the chart cassette is locked and fixed in place.

(11) Turn the chart feed dial a few times to make sure that the chart is fed correctly.



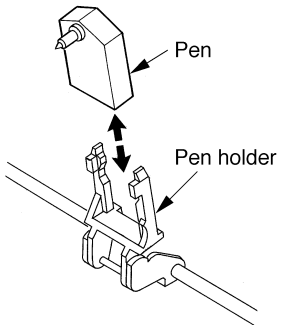
Handling Precautions

The chart is not fed immediately due to gear backlash (play between pairs of engaging gears). To reduce backlash, turn the chart feed dial, and then turn it lightly again in the opposite direction until the dial comes to a stop. We recommend this operation to align the chart time axis line.

■ Loading (replacing) the Pen (pen type model)

Read this section when using a pen type model.
If you are using a dot printing type model, see "**■ Loading (replacing) the Ink Pad (dot printing type model)**".

(1) Open the door.
(2) Set the power switch to OFF.
(3) Pull down the lock lever on the right side and draw out the inner mechanism.
(4) With the pen holder facing up, align the groove on the uncapped pen with the claw on the holder, and lightly push in. When you are using a 2-pen type model, attach the red pen for channel 1 on the lower holder and the blue pen for channel 2 on the upper holder.



Handling Precautions
Match the indicator color with the pen color.

(5) Insert the pen into the pen holder as far as possible, and gently bring the pen tip into contact with the recording paper.

Handling Precautions
- Do not forcibly move the holder to the left or right. Doing so might cause faulty operation.
- Do not grab the pen tip. Applying excessive force might deform the pen.
- Do not attach the pen with its cap still attached. Doing so might cause a damage.
- When you are not using a pen, remove it from the CQ, and store it with its cap attached to prevent the pen tip from drying.

(6) Return the inner mechanism to its original position, and make sure that the lock lever is firmly locked.

Note

Model No. of pen (red): CRP100R (one set, 10 pieces)
Model No. of pen (blue): CRP100B (one set, 10 pieces)
The service life of pens is generally 800 meters or more of chart paper.

■ Loading (replacing) the Ink Pad (dot printing type model)

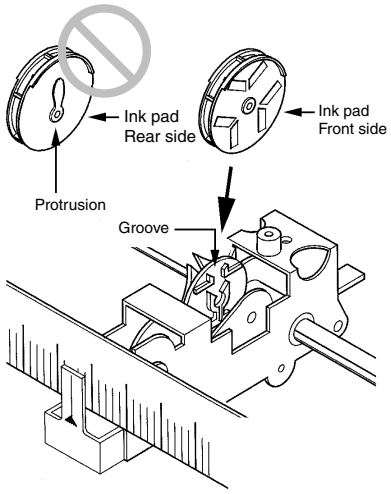
Read this section when using a dot printing type model.
If you are using a pen type model, see "**■ Loading (replacing) the Pen (pen type model)**".
In the case of a model with the alarm function, conduct the following operation after setting the alarm setting switch [ALARM] to the center position:

The ink pad is replaced with the power ON.
(1) Open the door.
(2) Set the power switch to ON.
(3) Push in the ink pad button [INK PAD] once to move the indicator to the center of the scale. When the indicator comes to a stop, the ink pad can be replaced.

Handling Precautions

Keeping the ink pad button [INK PAD] held down continuously moves the indicator.

(4) Pull down the lock lever on the right side and draw out the inner mechanism.
(5) Align the protrusion on the ink pad with the groove on its holder, and lightly push in.



Handling Precautions

- An error in operation may occur if the ink pad has been mounted or dismounted under conditions other than those listed for ink pad replacement.
- An error in operation may occur if a ink pad is forced into the holder in revese.

(6) Return the inner mechanism to its original position, and make sure that the lock lever is firmly locked.
(7) Press the ink pad button [INK PAD] again to enable recording.

Handling Precautions

- Ink pads differ according to model No.
- Do not replace ink pad until the indicator is moved to the center of the scale by pressing the ink pad button [INK PAD].
- Do not move the holder forcibly to the left or right. Doing so might cause faulty operation.
- Do not fill the ink pad with ink. Doing so might cause faulty operation.

Note

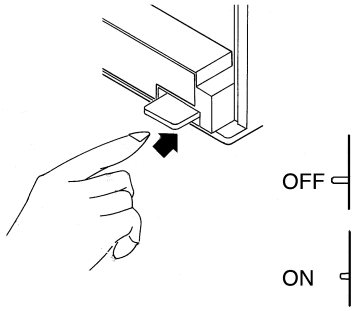
Model No. of ink pad (for 2-dot printing): 81446688-001
Model No. of ink pad (for 3-dot printing): 81446689-001
Model No. of ink pad (for 6-dot printing): 81446690-001
The service life of ink pad is generally two rolls of chart paper (16 m).

4 - 2 Operation

■ Turning the Power ON

The recorder's power switch is located at the right bottom of the front inside when you open the door.

Pressing the power switch turns the power ON, and pressing it again turns the power OFF.



⚠ Handling Precautions

- The CQ's warm up time is approx. 30 minutes.
- If input wiring is connected in parallel to other equipment, avoid turning the power ON or OFF during operation. Doing so might adversely influence measurement values.

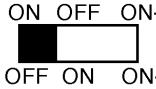
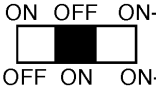
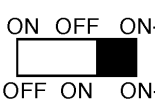
■ Starting and Stopping Recording

Start and stop recording by sliding the mode switch.

● Standard model

Mode Switch	Recording
	Chart is not fed.
	Chart is fed and recorded.

● Model with alarm (optional function)

Mode Switch	Recording	Alarm
	Chart is fed and recorded.	Does not operate.
	Chart is not fed.	LED lights and relay is actuated when alarm conditions are satisfied.
	Chart is fed and recorded.	LED lights and relay is actuated when alarm conditions are satisfied.

■ External Switch Input Function (optional function)

This function is disabled if the external switch input option is not supported.

● Servo lock function (pen type model)

The pen motor can be controlled externally.

The servo lock is enabled and disabled by opening and closing the dry contacts connected to the external switch input terminals across ⑩ and ⑫ (1-pen type) and across ⑬ and ⑮ (2-pen type).

Contact open: Servo lock is enabled, and the pen does not move even if PV input changes.

Contact closed: Normal recording is carried out.

● Recording stop function (pen type/dot printing type)

Chart feed can be stopped by external switch inputs.

Recording is started and stopped by opening and closing the dry contact connected to the external switch input terminals across ⑯ and ⑱ (pen type) and across ⑲ and ㉑ (dot printing type).

! Handling Precautions

This function is valid only when the mode switch on the operation panel is set to “recording stop” (REC OFF).

Mode Switch	External Switch Input	Recording
REC ON	Open	Recording starts.
REC ON	Closed	Recording starts.
REC OFF	Open	Recording stops.
REC OFF	Closed	Recording starts.

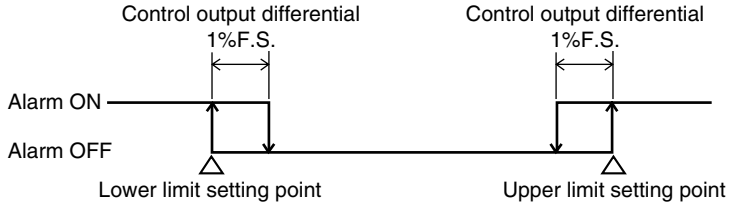
Chapter 5. BASIC CONFIGURATION

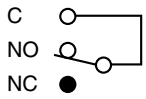
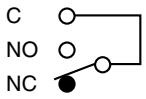
5 - 1 Alarm Setting (optional function)

Read this section if you have selected the model with the alarm display option.
On pen type models, two alarms can be set only on 1-pen type models.
On dot printing models, two alarms can be set common to all channels.
When the alarm set points are set, the LED lights when the measurement value reaches this preset value, and the alarm relays are actuated.

■ Alarm Operation

Lower limit alarm (LOW): The LED lights when the measurement value falls below the set point, and alarm relay is actuated.
Upper limit alarm (HIGH): The LED lights when the measurement value rises above the set point, and alarm relay is actuated.
The figure below shows the concept of alarm operation.



Operation Status	LED	Alarm output terminal
Alarm ON	Lights	
Alarm OFF	Goes out	
At power OFF	Goes out	

! Handling Precautions

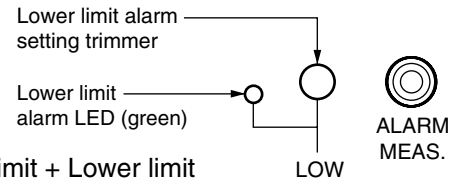
When the CQ is turned ON/OFF, alarm output is sometimes switched to the alarm mode momentarily. When controlling other equipment directly with alarm outputs from the CQ, use a delay timer.

■ How to Set Up the Alarm (pen type model)

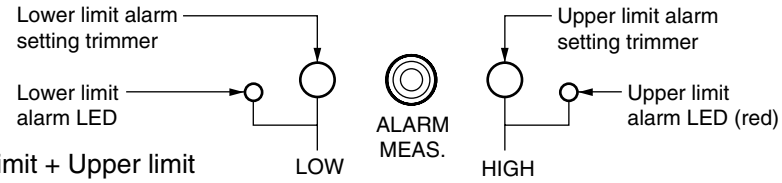
Five alarm types are provided on CQ models: “upper limit”, “lower limit”, “upper limit + lower limit”, “upper limit + upper limit”, and “lower limit + lower limit”. The operation panel of each model is as follows:

Upper limit

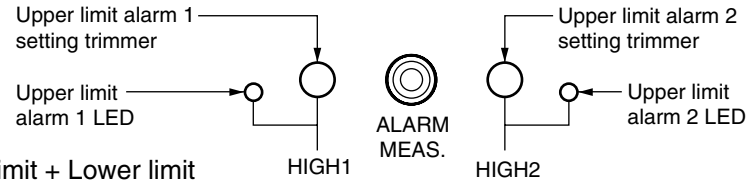
Lower limit



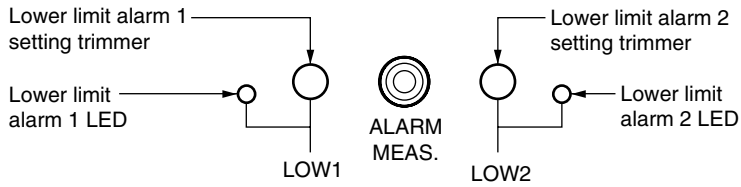
Upper limit + Lower limit



Upper limit + Upper limit

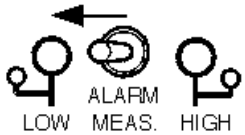


Lower limit + Lower limit



(1) Slide the mode switch to “ALARM ON” (center or right side) mode.

(2) Flip the alarm setup switch [ALARM] to the desired alarm LED to be set.
In this example, flip the alarm setup switch to the left to use lower limit setting.



(3) Turning the alarm setup trimmer with the flathead screwdriver (provided) moves the indicator of pen 1 and changes the alarm set point.

(4) When the indicator reaches the desired alarm set point, stop turning the trimmer and return the alarm setup switch [ALARM] to the center.

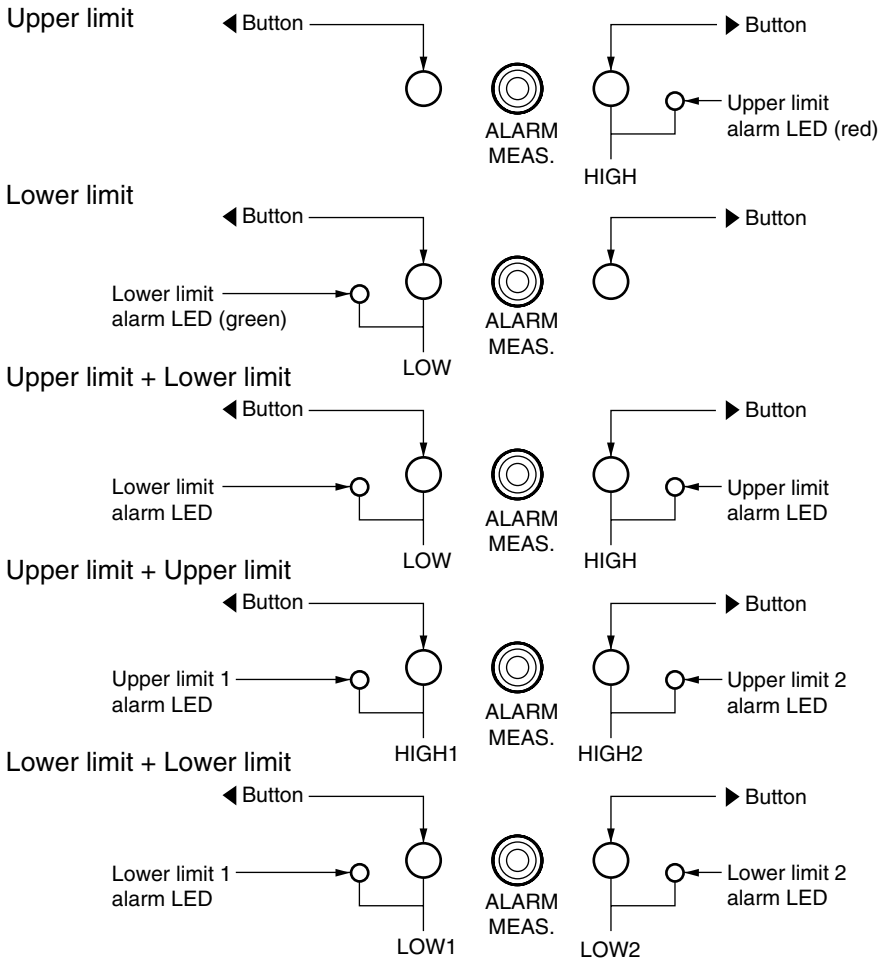
(5) Flip the alarm setup switch [ALARM] again, and make sure the indicator moves to the set point.

[!] Handling Precautions

The alarm setting value data is not cleared from memory even if the power is turned OFF.

■ How to Set Up the Alarm (dot printing type model)

Five alarm types are provided on CQ models: “upper limit”, “lower limit”, “upper limit + lower limit”, “upper limit + upper limit,” and “lower limit + lower limit”. The operation panel of each model is as follows:



(1) Slide the mode switch to the “ALARM ON” (center or right side) mode.
(2) When you flip the alarm setup switch [ALARM] to the desired alarm LED to be set, the indicator moves to the alarm set point and comes to a stop.
(3) To change the alarm set point, press the t or s button.
(4) When the ink pad button [INK PAD] is pressed, the print head prints twice, and the set point is registered.
(5) Return the alarm setup switch [ALARM] to the center.
(6) Flip the alarm setup switch [ALARM] again, and make sure the indicator moves to the set point.

! Handling Precautions

The alarm setting value data is not cleared from memory even if the power is turned OFF.

5 - 2 Changing the Chart Feed Speed

⚠ WARNING

Before changing the chart feed speed, be sure to turn the power OFF.
Failure to do so might cause electric shock.

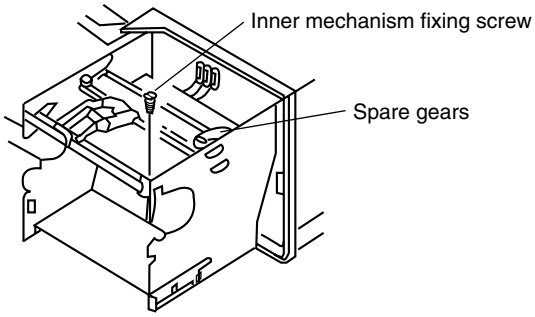
The chart feed speed can be changed to 2X or 4X the factory setting by changing the combination the gears. Three gears are provided: large, medium-sized and small gears.

● **Items to prepare**

Phillips screwdriver

● **Changing procedure**

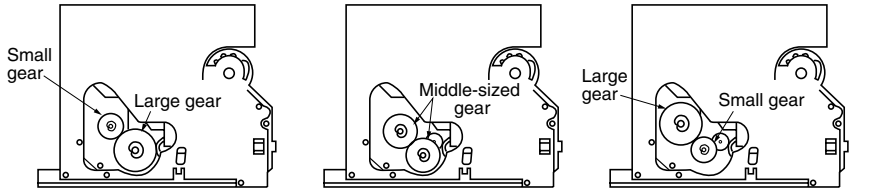
(1) Make sure that the power switch is set to OFF.
(2) Open the door.
(3) Pull down the lock lever and draw out the inner mechanism.
(4) Remove the chart cassette from the main unit.
(5) Loosen the inner mechanism fixing screw as shown in the figure and remove the inner mechanism.



Handling Precautions

The screw need not be removed completely. It can be removed loosening halfway.

(6) Remove the spare gear if necessary.
(7) Change the combination of the gears on the left panel of the chassis. Gears can be removed by pulling them towards you. When inserting gears, push them in with the gear shaft aligned with the shaft chamfer.



Factory setting | 2X speed of factory setting | 4X speed of factory setting

(8) Make sure that gears are properly engaged.
(9) Return the unused gear to the spare gear storage space.
(10) Return the inner mechanism to its original position, and tighten the inner mechanism fixing screws.

5 - 3 Changing the Power Frequency (pen type AC model only)

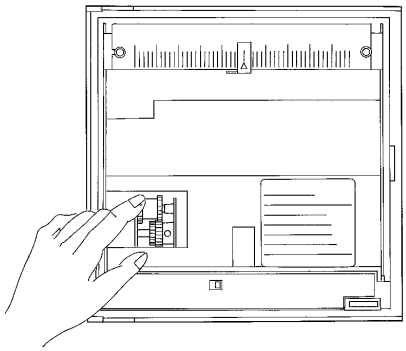
If you are using a pen type AC model at a frequency different from the one specified on the nameplate, the gear combination must be changed.

● **Items to prepare**

Allen key (provided)

● **Procedure**

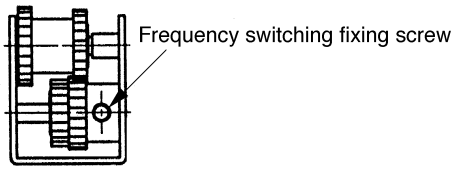
(1) Open the door and draw out the chart cassette.
(2) Set the power switch to OFF.
(3) Lift up the switching gear with your finger so that the fixing screw of the frequency switching gear can be seen.



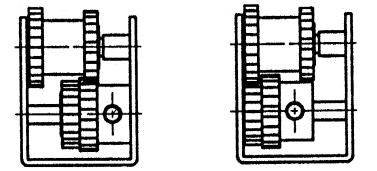
Handling Precautions

If the frequency switching gear fixing screw is not facing the front, turn the power ON, and set the CQ to the recording mode until the fixing screw faces the front. Then, turn the power OFF again.

(4) Loosen the frequency switching gear fixing screw on the left inside of the inner mechanism with an Allen key so that the frequency switching gear can be moved to the left and the right.



(5) Tighten the frequency switching gear fixing screw at the 50 Hz or 60 Hz position at a tightening torque of 0.2 to 0.3 N•m.
After you have changed the frequency setting, we recommend entering the power frequency on the nameplate.



Handling Precautions

- Tightening at a torque higher than the recommended torque might damage the gears.
- When a frequency different from the power frequency is set, a feed error occurs in the chart feed amount.

Chapter 6. MAINTENANCE & INSPECTION

6 - 1 Periodic Inspection

To ensure prolonged use of the CQ, periodically inspect the operating status of the CQ and maintain it in proper working order. Perform the following inspections, and replace consumables and maintenance parts as required.

● **Do display and recording operate normally?**

If trouble occurs, see **Chapter 7. Troubleshooting**.

● **Is the chart fed correctly without paper jamming, etc.?**

If trouble occurs, see "■ **Loading the Chart**" in **Chapter 4. Preparation and Operation**.

● **Are recorded lines faint?**

For details on how to replace the pen, see "■ **Loading the Pen**" in **Chapter 4. Preparation and Operation**.

For details on how to replace the ink pad, see "■ **Loading the Ink Pad**" in **Chapter 4. Preparation and Operation**.

● **Is there remaining chart?**

When the CQ begins to run out of chart paper, a red warning mark is printed on the right side of the recording paper. Replace with new chart referring "■ **Loading the Chart**" in **Chapter 4. Preparation and Operation**.

● **Is the shaft dirty?**

If the shaft is dirty, see "**6-2 Cleaning**".

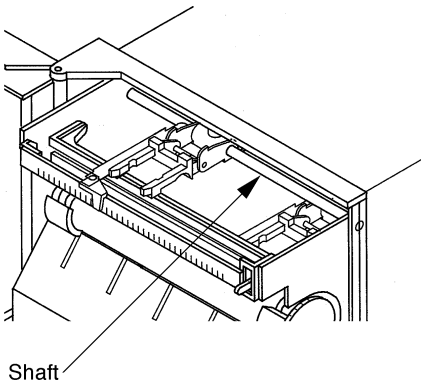
🕮 Note

- The periodic inspection cycle is dependent on the installation environment and operating conditions. Perform the periodic inspection every six months in dusty environments or when changes in indicator movement are excessive, and once every year in environments that are hardly subject to dust or when there is little change in indicator movement.
- Clean the unit every month.

6 - 2 Cleaning

To maintain the CQ in proper working order, clean the shaft every month. The procedure is as follows:

Wipe the shaft with a soft cloth or paper that does not produce any fluff.
Wipe the shaft with soft cloth or paper moistened with ethyl alcohol only when it is difficult to remove dirt or stains from the shaft.



(Note) The figure above shows a pen type model. On dot printing type models, the printing section is different.

Handling Precautions

Do not apply lubrication oil to the shaft. Doing so might cause faulty operation.
Do not use paint thinner, benzene or other volatile solvents, or wipe parts with a cloth moistened with these solvents. Doing so might cause discolor or deform parts.

Note

Recommended cleaning cloth: Kim Wipe® made by Crecia Co., Ltd.

6 - 3 Replacing the Fuse

⚠WARNING

To prevent danger before you replace the fuse, turn the power OFF, and disconnect the CQ from its power supply.
Failure to do so might cause electric shock.

Use only the specified fuse. Do not use other fuses.
Doing so might cause fire.

Model No. of maintenance parts:

Model No.	Item	Applicable Model	Remarks
81446691-001	Fuse	100 to 120 Vac model	1 set (5 pieces)
81446691-002	Fuse	200 to 240 Vac model	1 set (5 pieces)
81446691-003	Fuse	12 Vdc 1-pen type and dot printing type 24 Vdc 2-pen type	1 set (5 pieces)
81446691-004	Fuse	12 Vdc 2-pen type	1 set (5 pieces)
81446691-005	Fuse	24 Vdc 1-pen type	1 set (5 pieces)

Handling Precautions

Replace fuses periodically (about every two years) to prevent unexpected fusing.

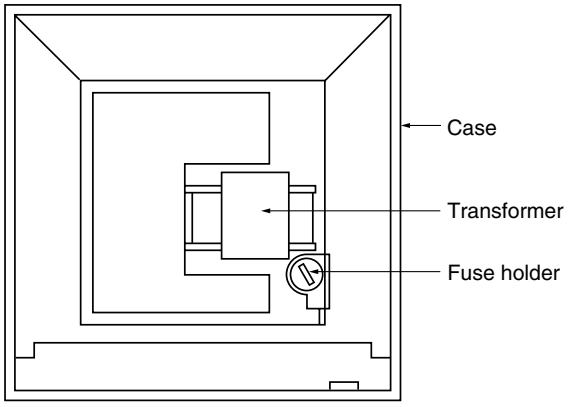
● Items to prepare

- Phillips-head screw driver
- Flat-whead screw driver
- Maintenance parts Fuse: Differs according to the power supply.

● Replacement procedure

(1) Draw out the chassis. For details on how to draw out the chassis, see "**5-2 Changing the Chart Feed Speed**".

(2) The fuse holder is located at the bottom right of the transformer. Turn the screw counterclockwise to remove the fuse.



(3) Insert the new fuse in the fuse holder, and turn the screw clockwise to fasten the fuse holder.

(4) Return the chassis to its original position, fasten the chassis with the screw and turn the power ON.

Chapter 7. TROUBLESHOOTING

This section describes possible causes when trouble occurs and how to remedy trouble.
If the CQ is not working properly even though a remedy has been carried out, a probable cause is that the CQ is malfunctioning.
Turn the power OFF and contact us for repair.

● No operation at all

Check item	Remedy
Is the power switch on the main unit ON?	Set the power switch at the top right on the main unit to ON.
Does the power switch operate normally?	
Is power supply correctly connected?	Connect the power correctly.
Is power supplied correctly?	Check the power and frequency specifications, and supply the power correctly.
Has the fuse blown?	Remove the cause of the fuse blowing, and replace the fuse. (See “6-3 Replacing the Fuse”.)

● No indicator operation

Check item	Remedy
Is the power switch on the main unit ON?	Set the power switch at the top right on the main unit to ON.
Is power supply correctly connected?	Connect the power correctly.
Is power supplied correctly?	Check the power and frequency specifications, and supply the power correctly.
Has the fuse blown?	Remove the cause of the fuse blowing, and replace the fuse. (See “6-3 Replacing the Fuse”.)
Is the input correctly wired?	• Wire correctly. • Tighten the terminal screw correctly. • Make sure that the resistance temperature detector is insulated from the earth. • Replace the broken thermocouple.
Does the servo lock operate? (pen type)	Close the external switch inputs.
Is the unit in alarm setup status? (with alarm option)	Set the alarm setup switch to the center position.

● The chart is not being fed

Check item	Remedy
Is the power switch on the main unit ON?	Set the power switch at the top right on the main unit to ON.
Is power supply correctly connected?	Connect the power correctly.
Is power supplied correctly?	Check the power and frequency specifications, and supply the power correctly.
Has the fuse blown?	Remove the cause of the fuse blowing, and replace the fuse. (See “6-3 Replacing the Fuse”.)
Is the mode switch set to “REC=ON”?	Set the mode switch to “REC=ON”.
Is the chart cassette correctly inserted?	Insert the chart cassette correctly.
Is the chart loaded correctly? Has the chart come loose from the sprockets?	Load the chart correctly.
Has the chart feed gear come loose?	Make sure that the chart feed gear is correctly attached in place.

● Recording is not carried out

Check item	Remedy
Is the power switch on the main unit ON?	Set the power switch at the top right on the main unit to ON.
Is power supply correctly connected?	Connect the power correctly.
Is power supplied correctly?	Check the power and frequency specifications, and supply the power correctly.
Has the fuse blown?	Remove the cause of the fuse blowing, and replace the fuse. (See “6-3 Replacing the Fuse”.)
Is the mode switch set to “REC=ON”?	Set the mode switch to “REC=ON”.
Is the chart cassette correctly inserted?	Insert the chart cassette correctly.
Is the pen-up lever up? (pen type)	Lower the pen-up lever.
Is the pen filled with a sufficient amount of ink? (pen type)	Replace with a new pen.
Is the ink pad loaded correctly? (dot printing type)	Load the ink pad correctly.
Does the ink pad have enough ink? (dot printing type)	Replace with a new ink pad.

● Ink pad cannot be moutned (dot printing type model)

Check item	Remedy
Are the conditions for ink pad replacement met?	Refer to page 28.
Is the ink pad positioned correctly? (Verify right and left sides and the top and bottom.)	Refer to page 28.

● The indicator is at the “zero” or “span” positions

Check item	Remedy
Is the input within the specification?	Connect an input within the specification.
Have electrical noise countermeasures been adopted?	• Separate the input wiring from the electrical source of the noise. • Ground the CQ. • Ground the measurement target. • Make sure that the thermocouple and the measurement target are insulated. • Use a shielded cable for the input signal lead. • Use an input filter.
Have external temperature change countermeasures been adopted?	Attach the input terminal cover correctly.
Is the input wiring correct?	• Wire correctly. • Tighten the terminal screw correctly. • Make sure that the resistance temperature detector is insulated from the earth. • Replace the broken thermocouple.

● Chart feed timing is incorrect

Check item	Remedy
Is the power frequency correct? (pen type AC model)	• Supply power with the appropriate frequency. • Change power supply frequency or chart feed speed as necessary.
Has the chart feed gear been changed?	• Change the chart feed speed as necessary.

● No alarm operation

Check item	Remedy
Is the mode switch set to “ALARM=ON”?	Set the mode switch to “ALARM=ON”.
Is the alarm setting value set correctly?	Set the alarm setting point correctly.
Is the alarm output wiring correct?	• Wire correctly. • Tighten the terminal screw correctly.

● External switch inputs do not operate

Check item	Remedy
Is the external switch input wiring correct?	• Wire correctly. • Tighten the terminal screw correctly.
Is the contact (switch) within the specification?	Use a contact (switch) within the specification.

Chapter 8. SPECIFICATIONS

■ General Specifications

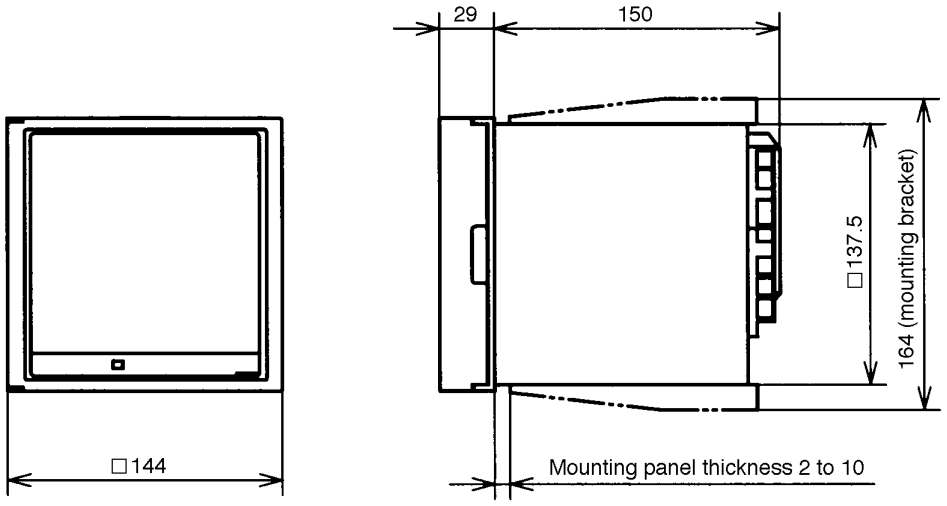
Insulation resistance	Min. 20 MΩ across power terminal and GND terminal (by 500 Vdc megger) Min. 20 MΩ across input terminal and GND terminal (by 500 Vdc megger)	
Dielectric strength	Across power terminal and GND terminal 1500 Vac for 1 minute (AC power supply model, leak current 5 mA max.) Across input terminal and GND terminal 1000 Vac for 1 minute (AC power supply model, leak current 5 mA max.) Across power terminal and GND terminal 500 Vac for 1 minute (DC power supply model, leak current 5 mA max.) Across input terminal and GND terminal 500 Vac for 1 minute (DC power supply model, leak current 5 mA max.)	
Induction resistance	Common mode rejection rate: 120 dB, 250 Vac max. Normal mode rejection rate: Max. 2X of 40 dB span	
Standard conditions	Temperature	23±2°C
	Humidity	55±10%RH
	Voltage fluctuation	±1% of rated power voltage
	Power frequency fluctuation	±1% of rated power frequency (AC power supply model)
	Vibration, electrical noise, surge voltage	Not allowed
	Influence from other equipment	Not allowed
	Mounting	Horizontal
Operating conditions	Temperature	0 to 50°C
	Humidity	30 to 85%RH (condensation not allowed)
	Power voltage	±10% of rated power voltage
	Power frequency fluctuation	±2 Hz of rated power frequency (AC power supply model)
	Vibration, electrical noise, surge voltage	0.2 m/s^2 max. (10 to 60 Hz)
	Mounting	Bottom rear angle to 30° from horizontal
Transportation/storage conditions	Ambient temperature	-20 to +60°C
	Ambient humidity	10 to 95%RH (no condensation allowed)
	Shock resistance	300 m/s^2 max. (continuously for 11 ms max.)
	Vibration resistance	5 m/s^2 max. (10 to 60 Hz, for two hours in each of X, Y and Z axes)
Rated power voltage/frequency	According to the model No. specification 100, 110, 120, 200, 220, 240 Vac 50 Hz or 60 Hz, and 12 and 24 Vdc (pen type) 100, 110, 120, 200, 220, 240 Vac 50/60 Hz, and 12 and 24 Vdc (dot printing model)	
Power consumption	7 VA max. (1-pen type, AC power supply model) 11 VA max. (2-pen type, AC power supply model) 13 VA max. (dot printing type, AC power supply model) 7 W max. (1-pen type, DC power supply model) 11 W max. (2-pen type, DC power supply model) 13 W max. (dot printing type, DC power supply model)	
Rush current	8 A max. (10 ms max.)	
Material	Door	Deformed PPE, glass window
	Case	Deformed PPE
Color	Door frame	Black (standard)
	Case	Black (standard)
Mounting	Imbedded in indoor panel (changeable to a carrying type using carrying handle kit)	
Mass	Approx. 1.8 kg (1-pen type), approx. 2.0 kg (2-pen type and dot printing type)	
Standard accessories	Folding chart: 1 roll, mounting bracket: 1 set, User's manual (CP-SP-1048E): 1, pen: 1 set (pen type) or ink pad: 1 (dot printing type), Allen key: 1 (pen type), screwdriver: 1 (pen type with alarm)	

■ Performance Specifications

Input	Input type	Thermocouple, resistance temperature detector, DC voltage, DC current (See the model listing table.)
	Range	See the model listing table.
	Allowable wiring resistance	Thermocouple/DC voltage input: 2 kΩ or less. However, 250 Ω or less in case of thermocouple input with burnout upper limit or lower limit. Resistance temperature detector: 10 Ω per lead (However, resistance of three leads must be balanced.)
	Input impedance	1 MΩ min. (thermocouple, resistance temperature detector and DC voltage input) 250 Ω (DC current input)
	Burnout	Selectable from none, upper limit and lower limit according to the model No. (only thermocouple input)
	Input bias current	Thermocouple/DC voltage input: ±50nA max. (±100nA max. for a thermocouple input with burnout) Resistance temperature detector: Approx. 2mA
Display	Scaling method	Horizontal scale, eff. width of overal scale 100 mm
	Scaling characteristics	Thermocouple/resistance temperature detector input: Scaling of temperature characteristics DC voltage/DC current input: linear scaling
	Display accuracy	±0.5%FS (standard conditions, without burnout) See Table 2 Range (page 4) for exceptions to the above.
	Dead band	0.3%FS (standard conditions)
Recorder	Recording method and recording color	1-pen: red 2-pen: Channel 1 (red), Channel 2 (blue) 2-dot printing: Channel 1 (red), Channel 2 (blue) 3-dot printing: Channel 1 (red), Channel 2 (blue), Channel 3 (green) 6-dot printing: Channel 1 (red), Channel 2 (blue), Channel 3 (green), Channel 4 (pink), Channel 5 (purple), Channel 6 (brown)
	Pen speed (pen type)	Approx. 1 s/FS or less
	Recording cycle (dot printing type)	2-dot: 12 s 3-dot: 18 s 6-dot: 36 s
	Recording accuracy	±0.5%FS (Standard conditions, without burnout) Except the range with an asterisk (*) on page 4.
	Chart type	Folding type, eff. width of recording area 100 mm, length 16 m
	Chart feed speed	Specify according to the model No. 10 mm/h (changeable to 20 or 40 mm/h) 20 mm/h (changeable to 40 or 80 mm/h) 10 mm/min (changeable to 20 or 40 mm/min, applicable only on pen type) 20 mm/min (changeable to 40 or 80 mm/min, applicable only on pen type)
Alarm (option)	Alarm setting accuracy	±0.85%FS
	Control output differential	1.0%FS max.
	Alarm relay	SPDT (NO/NC) 250 Vac 3A/30 Vdc 3A max. (at resistive load) Min. applicable load: 5 Vdc 100 mA, 24 Vac 50 mA
	Alarm type	Can be specified from one upper limit, one lower limit, one upper limit + one lower limit, two upper limits and two lower limits. On dot printing models, operation is carried out without the channel recognized. Note: Alarms are not supported on 6-dot printing 2-type input model. On pen type models, only 1-channel models are recognized, and alarms are not supported on 2-channel models.
External switch inputs (option)	Function	Recording start/stop (dot printing type/pen type) and servo lock enable/disable (pen type only) (Note: The “servo lock” is a function for latching the pen at the current recording pen position regardless of PV input.)
	Switch type	Only dry contacts (Note: Open collector cannot be used.)
	Contact capacity	Servo lock: 20 Vdc, 500 mA min. Recording start/stop: 20 Vdc, 100 mA min.
Other	Pen-up function	Pen can be raised by the lever. (pen type only)
	Limitter function	Connecting false inputs to unused channels is not necessary.

■ External Dimensions

(Unit: mm)



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Revision History

Printed Date	Manual Number	Edition	Revised pages	Description
Nov. 1998	**CP-SP-1048E**	**1st Edition**		
Feb. 2002		**2nd Edition**	iii,20 4 5 9 21 28 40 43	RESTRICTIONS ON USE changed Safety precautions added "Do not wiring unused terminals" Range code T30 added "-50 to +150" Range code T40,E40,J40,T43,K43,T44,E44,J44, K44 deleted Range code B40 changed "0 to 1800" Display accuracy changed "*" marked range Range code 32 changed "-25 to +25" CQC model added for all code in Table 8 Note added in Wiring inputs Description on loading the ink pad changed, Handling precautions added Trouble shooting added "Ink pad cannot be mounted" Input bias current added, Display accuracy changed, refer to Table 2 Range (page 4)
Nov. 2003		**3rd Edition**		RESTRICTIONS ON USE changed
Oct. 2005		**4th Edition**	3 4, 5 20	Model No. code S, B, W, N deleted Table 2 Range changed Instrument cable changed
July 2006		**5th Edition**	10	Model No. 81446699-001, Model name changed Chart holder to Chart holding spring
Mar. 2007		**6th Edition**	10, 11	■ Consumables discription added
Apr. 2008		**7th Edition**	ii 45	SAFETY PRECAUTIONS changed. Recording accuracy added.
Feb. 2011		**8th Edition**	Endpaper ii, 18, 19 23,28 End of the manual	RESTRICTIONS ON USE deleted. Warning/caution sentences about turning off the power were changed. Pages corrected according to the errata attached to the previous version. Terms and Conditions added.
Apr. 2012		**9th Edition**		Company name changed.
July 2013		**10th Edition**	9 End of the manual	Table 10 was corrected. AAS-511A-014-02

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.
You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.
In the case of products that Azbil Corporation has repaired for a fee, the repaired part only shall be warranted for three (3) months from the time of delivery to the location designated by the customer.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place.
Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

(1) Failure caused by your improper use of azbil product
(noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
(2) Failure caused for other reasons than Azbil Corporation's product;
(3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
(4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
(5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
(6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

(1) Regulations and standards or laws that your Equipment is to comply with.
(2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
(3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down.
You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.
*2. A design that is safe even if the device fails.
*3. Avoidance of device failure by using highly reliable components, etc.
*4. The use of redundancy.

3. Precautions and restrictions on application

Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).
Any Azbil Corporation's products shall not be used for/with medical equipment.
The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product.
However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.
In addition,
you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below.
Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
* Nuclear energy/radiation related facilities
[For use outside nuclear energy controlled areas] [For use of Azbil Corporation's Limit Switch For Nuclear Energy]
* Machinery or equipment for space/sea bottom

* Transportation equipment
  [Railway, aircraft, vessels, vehicle equipment, etc.]
* Antidisaster/crime-prevention equipment
* Burning appliances
* Electrothermal equipment
* Amusement facilities
* Facilities/applications associated directly with billing

(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification.
Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.
In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used.
Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals.
System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts.
For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason.
For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice.
For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts.
For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service.
Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

azbil

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Specifications are subject to change without notice. (09)

1st edition: Nov. 1998
10th edition: July 2013 (M)